The Magazine of the Registered Professional Engineer

American Engineer

AUGUST 1959

PCA Research and the Cement Story

See page 17

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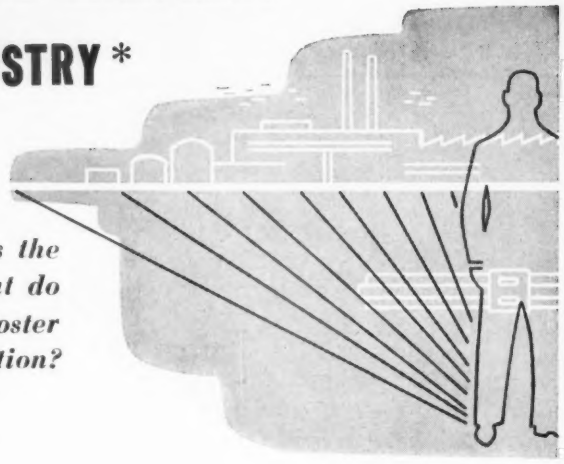
Executive Research Survey Report

CAREER SATISFACTIONS of PROFESSIONAL ENGINEERS IN INDUSTRY*



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Note These Chapter Titles:

- **Career Outlook of Professional Engineers**
- **Satisfaction and Frustration on the Job**
- **The Question of Professional Status**
- **Are The Values of the More Successful Engineers Different from the Others?**

* Survey made by the Opinion Research Corporation, Princeton, N. J., for the Professional Engineers Conference Board for Industry, in cooperation with the National Society of Professional Engineers.

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AUGUST 1959
Vol. 29, No. 8

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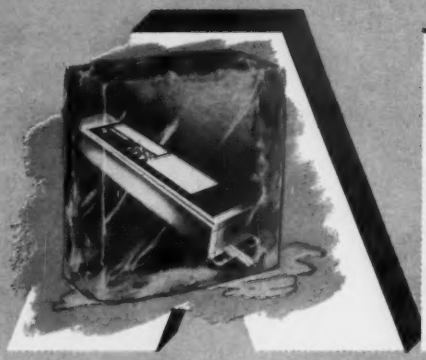

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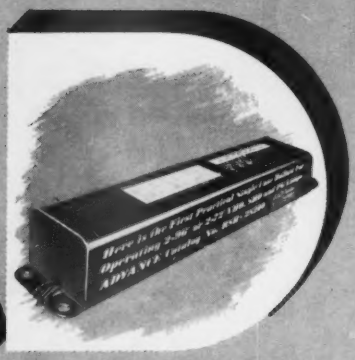

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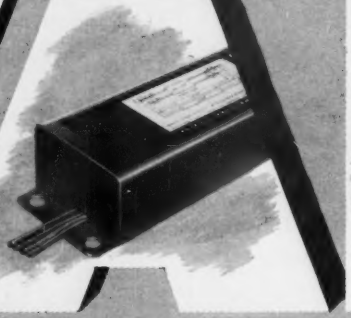

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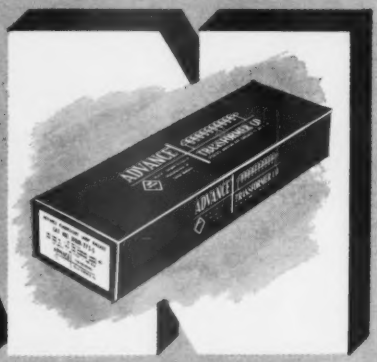

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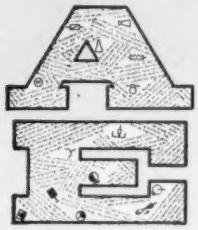

"This Month"

It takes engineers from nearly all branches of the profession to keep the cement industry going and the fascinating story of how they do it begins on page 17. "PCA Research and the Cement Story" is a study in team play and spirit.

When President Eisenhower opened the Soviet Exhibition in New York recently he did not conceal the impression the Russian's progress in technology made upon him. This, in turn, impressed the AE and a staff writer was sent up to give the affair individualized coverage. The AE man and five outstanding members of the New York State SPE toured the show and their impressions (with photos) begin on page 23.

Our "Engineer at Work Piece" (page 27) deals with the design and construction of the new Dulles International Airport outside of Washington, D. C. This article is in furtherance of AE's new policy (at the request of our readers) to focus the nontechnical spotlight on projects (construction and otherwise) in which the profession can take great pride.

The "Women in Engineering" piece on page 31 carries the caption, "Greater Use of a Great Potential," which just about tells the story. Read how America is catching up in a field where it was far behind.

A look at "This Month's" news:

General news: Thanks to NSPE, the Senate has amended a bill that will restrict TVA in the kind of engineering and construction work it can do in connection with lease-purchase arrangements. Page 8. . . And in another story, the Navy has "authorized and encouraged" its engineers to use the P. E. suffix.

Consulting: The Interior Department has thrown out a provision in its 1960 Appropriations Act which would have limited engineering and design costs to five per cent of the total cost of any project. . . In other news, NSPE again went before a Senate committee to push for the passage of the Keogh-Simpson bill. Both stories, page 10.

Education: Read on page 11 how New Jersey engineers and scientists have formed a group to guide high school students interested in engineering and science as a career. A "Big Brother" approach is used.

Industry: On page 13, an interesting story on how Western Electric engineers in the North Carolina works are fighting unionism. V.O.T.E. N.O.! In other developments, the National Labor Relations Board has issued three decisions of interest. Story on page 15.

NEXT MONTH, September, keep a sharp look-out for your AE. In addition to the many regular features, we will be pleased to present two special inserts of articles of particular interest to engineers in consulting and in government. These papers are by experts and range in subjects from "Let's be Realistic on Fees Schedules" for the consultants, to "Classifying Engineering Positions in the Federal Government" for those in government practice. (Note: Coming in the future, special inserts for those in education and industry.)

Kenneth E. Trombley

Editor

Letters to the Editor

On TVA . . .

Dear Editor:

Milton Lunch did a fine job of reporting . . . in his article in the June issue of AMERICAN ENGINEER entitled "TVA: Shadows and Fears."

It may be true that TVA is doing no more than other power companies, either public or private, in providing free engineering service; but if this is the case, I am certain that it is time that we as an engineering profession must examine the practice most closely. I am certain that you realize that this goes much deeper than wanting to keep this work on a selfish basis for consulting engineers. In my opinion such a practice, if it is allowed to continue and expand, could make the control of proper engineering practices most difficult. While most power companies may employ registered engineers and operate in a most ethical manner, there are bound to be some that will not. Furthermore, the practice, when once well established in the power industry, can easily expand to other industries.

L. E. MILLER, P.E.
Omaha, Neb.

► ***Editor's Note:*** **As a result of NSPE's testimony, the Senate Committee amended the bill to limit TVA to "necessary" engineering services in connection with lease-purchase projects.—See story, page 8.**

Questions Writer . . .

Dear Editor:

I have just received my June copy of AMERICAN ENGINEER. The cover format is outstanding inasmuch as it announces the 25th Anniversary of the National Society of Professional Engineers.

Over the years, I have read many of your articles with extreme interest and found them both educational and broadening. However, in this issue you have an article entitled "Engineers Turn to Seas for New Water Supply." It appears that this article is based on data received from the O.S.W., a U. S. Government Agency, but I wonder if your staff writer took pains to investigate the American industrial approach to the problem. I question this since on Page 21, you have an artist's conception of a Weir multiple flash sea water evaporation plant under construction for the Kingdom of Kuwait.

Possibly to some engineers in their ivory towers the conditions under which American manufacturers are compelled to market their product overseas is not too well known. Weir is a British concern backed by the British Government and, of course, Kuwait is a Kingdom whose product is directly related to the sterling market in England. Nowhere in your article did I notice any mention of an American concern who have equivalent plants or processes to market and unfortunately have to do this in competition with the English concerns who are either subsidized or backed financially in their terms of sale by the British Government. . . .

JOHN M. RYAN, P.E.
Jackson Heights, N. Y.

► ***Editor's Note:*** **As the article notes, private American firms as well as the OSW are moving ahead rapidly in the development of salt water conversion processes. The British plant is simply one example of an outstanding process and does not infer that there are not other developments both here and abroad. A picture of a plant constructed by Ionics, Inc., an American firm, was shown on the page opposite the illustration of the British plant.**

First Contract . . .

Dear Editor:

In the June, 1959, issue of AMERICAN ENGINEER your very comprehensive article on sea water conversion failed to mention that the first contract for the design of a demonstration plant will utilize the design and process of an Ann Arbor consulting engineering firm, W. L. Badger Associates, Inc.

CURTISS D. BASSETT, P.E.
Ann Arbor, Mich.

Nostalgic Article . . .

Dear Editor:

The excellent story in the May issue of AMERICAN ENGINEER, "Starting Your Own Consulting Office," by Robert H. Emerick, P.E., was nostalgic to this writer.

Incidentally, we wonder if the time has not come when the term "consulting engineer" should be discarded. The term certainly connotes clients coming to the engineer unsolicited and asking for his services. While this is occasionally true, everyone in the engineering business knows that it is necessary to go out and beat the bushes for clients.

Mr. Emerick makes the statement at the beginning: "Everybody's not suited to the consulting life" and closes his story with "But never forget—everybody is not suited for it." If everybody is not suited to the consulting life, surely that leaves nobody who is. In the interest of better engineering English allow us to say that "not everybody is suited to the consulting life," which would more nearly express the writer's intent.

HARRY A. MARSHALL, P.E.
Topeka, Kan.

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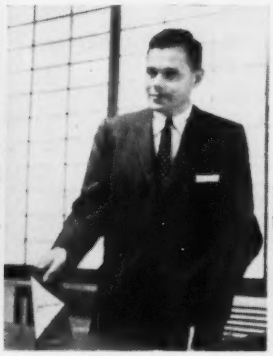

"My answer, quite simply, is no if, by 'secret', one means a magic formula . . .

"But there are practical, time-tested *reasons* why some men do so much better than others . . .

"They are: A willingness to pay the price of success, and a knowledge of business fundamentals."

By James M. Jenks

It's no secret that industry today needs executives badly to replace management men who retire or otherwise become inactive.

Despite everything that has been done to ease this shortage, the problem remains acute. One explanation was advanced by a well-known writer recently. He said, "The rapid and extensive growth of industry during the past decade has created a 'lost generation' among younger executives. There simply hasn't been time for them to acquire broad, practical experience in all phases of business. Thus, most of them have specialized in a particular function of business."

However over-simplified that statement may be, it does point up the importance of this advice:

Devote a few hours each week to the organized study of business fundamentals—Somebody, after all, has to coordinate the activities of all departments . . . and this naturally calls for a working knowledge of the major business functions. *Only* men who understand these principles can effectively communicate with department heads—make quick, accurate decisions—elevate their thinking to the executive level.

Take the initiative in training yourself, without waiting to be told what you should do to qualify for promotion. Remember that the primary responsibility for self-improvement falls on *you alone*. Most companies are willing to cooperate with and help employees—but only after the individual has demonstrated ambition.

Accept every assignment offered you, no matter how unrelated it may be to your regular duties. You should, in fact, go out of your way to look for such work to help acquaint yourself with new and unfamiliar business procedures.

"Stick out your neck"—take calculated risks—whenever you're reasonably sure that you're on solid ground. Unless you develop the confidence and courage to act boldly when decisive action is called for, you'll never pass the acid test of leadership.

Accept the fact that, in order to succeed, you must be willing to pay the price of success. In many respects this is the toughest of all the steps upward . . . because it affects your family as well as yourself. It frequently means delayed dinners—evenings studying rather than partying—uprooting family ties and friends for better opportunities elsewhere. And, to be entirely truthful, the major executive must usually continue to pay "the price of success" throughout his active career.

It wouldn't surprise us if, at this point, we had discouraged a large part of the men who started to read this message from reading further. But this is not, necessarily, a bad thing. Even some of the people who could qualify, with the proper training, for a responsible management job are sometimes more content with teaching school . . . or taking orders rather than giving them . . . *Everybody*, in short, is not cut out to be an executive. But if you're temperamentally suited for managerial work and can cope with its endless problems, no other field is so challenging, so absorbing, so satisfying.

(Circle 3 in Readers' Service Dept.)

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TVA Engineering Authority Clarified By Senate Bill

After many years of effort by the National Society to eliminate language authorizing TVA to perform engineering and design services for non-TVA and non-Federal interests, the Senate has passed the TVA revenue bond bill and clarified the engineering provision to make it applicable "only to such *necessary* work of this nature." The revision, made by the Senate Public Works Committee, adds the word "necessary" to the clause authorizing TVA to perform engineering and construction work and other services in connection with lease-purchase arrangements.

The bill had been previously passed by the House, and will now go to conference in order to resolve differences between the two versions, including the provision involving engineering authority.

In recent testimony before the Senate Committee on this matter, NSPE mentioned four specific instances where TVA engineers had performed free engineering services in competition with private consulting engineers available to engage in identical work. Paul H. Robbins, NSPE executive director, told the Committee that these specific examples represent "nothing more than the blatant fact that Federally-employed engineers are competing with private consulting engineers by providing, without charge to the client, the type of services normally supplied by independent consultants."

Mr. Robbins further declared that the Federal Government should not compete with its own citizens in the furnishing of material or services to non-Federal agencies or persons except under the most extreme or emergency conditions. "Such extreme or emergency conditions which would justify the assumption of this broad authority by TVA do not exist, and thus there can be no justification for the rendition of engineering services by the Federal Government when private firms are available and competent to perform identical work," he said.

Technical Men Featured At WESCON, Aug.18-21

More than 100 technical men and administrators who figure prominently in the nation's electronics picture have accepted roles as discussion leaders in the new plan for enlivening convention proceedings at the Western Electronic Show and Convention in San Francisco, August 18-21.

A special evening session on August 19 at the Mark Hopkins will feature Dr. Lloyd V. Berkner, president of Associated Universities, speaking on "The International Geophysical Years in Retrospect."

A so-called "panel of peers" will sit at sessions containing an average of three technical papers and offer comment leading to general discussion of ideas and information presented.

Navy Bureau Encourages Use of P.E. Suffix

The Navy's Bureau of Yards and Docks has authorized and encouraged its registered engineers and architects to use the appropriate professional suffix on business-form official correspondence, plans, pro-

American National Exhibition

The American National Exhibition opened in Moscow last month after much preparation. At the left, an Italian technician from Reynolds Feal Corporation, the American company that is building the U.S. Pavilion, demonstrates modern technique to a Soviet worker. Russian Premier Nikita S. Khrushchev, center, appears to be enjoying himself during a visit to the Kaiser Aluminum dome—shown under construction in the background. The partially completed dome is seen at right.

P.E.—Clergyman

Rev. A. F. Plant, also a registered professional engineer, and Harley, Ellington & Day (architects and engineers) representatives Lester H. Waldo (left), project administrator, and Julian R. Cowin, executive vice president, study construction progress of the new $1.5 million Episcopal Diocesan Cathedral Center in Detroit. (See story below.)

gram listings, engineering reports, articles and other appropriate uses. The approved suffix is "P.E." for registered engineers and "R.A." for registered architects.

The use of the professional suffixes has long been encouraged by professional societies, the Bureau said, and the practice is in line with the agency's efforts to promote registration of engineers and architects in their various states. In addition to encouraging more employees to become registered, "such designations would point up the professional stature of BuDocks employees," the directive by P. Corradi, deputy chief of the Bureau stated.

ARBA Releases New Engineer Directory

More than 1,700 names, titles and addresses of administrative engineers and officials in the fifty state highway departments, the District of Columbia, and Puerto Rico are listed in the 1959 edition of the convenient, pocket-sized directory, *Highway Officials and Engineers*, published by the American Road Builders' Association.

The directory may be obtained for $1 per copy from American Road Builders' Association, World Center Building, Washington 6, D. C.

Michigan Man Holds Unique Dual Posts

At his desk, he's Fletcher Plant, registered professional engineer—a veteran of better than forty years in the field—and a past president of both the Michigan SPE and the Detroit Chapter.

In the sanctuary, he's the Reverend A. F. Plant, administrative assistant to the bishop of the Episcopal Diocese of Michigan—a veteran of the cloth for some five years now.

And at the crossroads of the expanding cultural and medical center in Detroit (the Woodward-Warren area), he has combined both roles. In the construction of a $1.5 million Episcopal Diocesan Cathedral Center adjacent to St. Paul's Cathedral, Dr. Plant is serving as liason man between the architects, Harley, Ellington & Day, Inc., the Chapter (the governing group of St. Paul's Cathedral), and the bishop, the Rt. Rev. Richard S. Emrich.

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Eliminate Five Per Cent Fee Provision; NSPE 'Gratified'

The elimination from the Interior Department Appropriations Act for 1960 of a provision which would have limited engineering and design costs to five per cent of the total cost of any project has been hailed by Leslie C. Gates, Beckley, West Virginia, consulting engineer and chairman of NSPE's Functional Section for Consulting Engineers in Private Practice as "an extremely gratifying development."

In a statement shortly after the bill was cleared by both Houses of Congress, Mr. Gates declared that "the elimination of the five per cent fee restriction is an extremely gratifying development in that it will serve to confirm the Society's long-standing position that the interests of the Government can best be served if equitable fee arrangements for consulting engineering services are arrived at through negotiation based upon generally accepted fee schedules. The fee schedules take into consideration the size, complexity and special conditions surrounding any construction project, and these are the factors which must be acknowledged in the setting of engineering fees."

The proviso limiting engineering and design costs to five per cent of the cost of any project was inserted by the House, but later eliminated from the bill by the Senate. In its report on the bill, the Senate Appropriations Committee explained its action as follows:

While the committee is in complete accord with the House committee intent of reducing excessive engineering and design costs, it does not feel that the applying of a five per cent limitation on the cost of such services for each project will accomplish the desired result. In many instances, the failure to provide adequate funds for the proper engineering and design of a project could result in greatly increased construction costs.

The National Society, in testimony before the Senate Interior Appropriations Subcommittee, had urged the elimination of the five per cent limitation, pointing out that in many instances, such as in the case of a difficult timber road, engineering costs may be quite high in relation to the actual construction cost. "A fee limit determined in every case on the basis of construction cost, as proposed in the House version, fails to recognize or take into consideration extensive preliminary planning, such as aerial photography or photogrammetry, which precedes the actual design of the construction project," the Society said.

Vogt Urges Passage of Keogh-Simpson Bill

"Present Federal tax laws are a roadblock for self-employed consulting engineers because of the penalty which must be paid in terms of retirement income protection," a National Society spokesman has testified before the Senate Finance Committee.

Robert C. Vogt, a partner in the firm of Vogt, Ivers, Seaman & Associates of Cincinnati, testified that the Keogh-Simpson proposal to permit a tax deferment to self-employed citizens on sums placed in private retirement plans or annuity insurance "could materially aid our technological progress."

Mr. Vogt stated that the Keogh-Simpson bill "would encourage our scientists and engineers to achieve that degree of self-reliant individualism which is so vital for the fullest development of their technical competence."

NSPE spokesman emphasized that such legislation "would be a major contribution toward the enhancement of the professions from an economic standpoint and would assist in establishing a climate favorable to the professions for career development."

Mr. Vogt added that "a tax equalization program such as proposed by the Keogh-Simpson bill will do much to stimulate and encourage the development of the self-reliant, individualistic scientist or engineer who is free to take the risk of establishing a general or specialized consulting office so that he may offer clients new ideas, techniques or methods, without having to pay the penalty of sacrificing personal security which is available through the retirement programs of employers under the current provisions of the Internal Revenue Code."

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Use the Readers' Service Department—page 49.

New Jersey Engineers Act As 'Big Brothers' to Students

What is an engineer? How do I become an engineer? What do engineers do? Is there a difference between an engineer and a scientist? These are some of the many questions being asked by high school students interested in engineering or science as a career.

To calm their bewilderment a "big brother" approach has been adopted by a group of professional New Jersey engineers and scientists known collectively as the New Jersey Engineers' Committee for Student Guidance (NJCSG), who travel throughout the State of New Jersey speaking to groups of high school students and telling them the facts about embarking on a career in which they themselves have achieved success.

The information they give these inquiring young minds is based on their years of work experience and the initial trepidations they felt when first confronted with the question of choosing a career. In many cases the students have not previously been exposed to the world of science through personal contact with someone working in the field. Their knowledge of the inner workings of industry is vague and their confidence in their ability to succeed in so demanding a field is shaky. The result has been that many potentially qualified youngsters have never advanced beyond the, "I'd like to be an engineer or scientist" stage.

Frequently learning a little more about the field in which he has shown interest is enough to convince a student that he is suited to the profession. The NJCSG is not, however, an active recruiting agency to help fill the needs of the engineering fields and many times the reverse proves to be the outcome of their work. The Committee's aim is to indicate that while certain students are equipped to enter technical fields and should be encouraged to do so, others should select fields more suited to their abilities, interests, and talents.

Last year the NJCSG sent 232 speakers, 17 panels, 61 single speakers, and 14 student teams from Princeton University, Rutgers University, Stevens Institute of Technology, and Newark College of Engineering, to a total of 101 high schools in the State of New Jersey. These meetings were attended by 11,168 students who were interested in learning more about the technical fields. When the series first started in 1953 the total attendance was 1,049.

Through the meetings secretary, Dr. Frederic Russell, chairman of the Electrical Engineering Department at Newark College of Engineering, speakers are provided on request from a high school to discuss the engineering and scientific professions and to answer questions about various aspects of the fields. This year, high schools in more than twelve New Jersey counties have made use of NJCSG services. The panel type meeting is composed of five members—a lead speaker and a representative from each of the various branches of engineering who is capable of furnishing a complete and authoritative survey of his field. After introductory remarks from the lead speaker stating the purpose of the visit, the meeting follows one of three plans: a general question-and-answer period with only those interested attending; a general question - and - answer period with all students participating; or individual conferences with panel members for students interested in specific areas. Under each

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plan the student is encouraged to make definite inquiries and to discuss individual problems.

"This part of the program," maintains Dr. Russell, "is perhaps the most valuable from the point of view of the student. For it is here that he can ask questions which are of particular concern to his understanding. Whenever possible we split up the meeting so those students interested in mechanical engineering or civil or chemical can join the speaker who has talked on that subject. Then, in what amounts to seminar-fashion, the student is able to discuss his problems."

To learn the effectiveness of these panels, Dr. Herman A. Estrin, Department of English, Newark College of Engineering, sent a questionnaire to sixty high schools where NJCSG representatives delivered talks. Over eighty per cent of the high school counsellors answered. Unanimously, the counsellors agreed that the coverage of material was adequate and the presentations were well-suited to the students. As one high school guidance officer put it: "Three hundred junior high school students gave practically their undivided attention for two hours." This rather remarkable accomplishment of holding the interest of teen-agers for a sustained period of time is due partly to the before-speaking preparation each team undergoes.

When a speaker volunteers to be a member of a guidance panel he is mailed a speakers kit from Dr. Russell detailing the material that should be covered in a speech to a high school student. The outline explains the most successful devices used by previous panels insuring maximum coverage of subject matter; it further suggests the logical steps of a presentation to explain the engineering profession to a nonprofessional. Besides the valuable information transferred verbally to the students, carefully selected pamphlets, many of them written specially for NJCSG, are distributed and visual aids are employed to supplement the instruction.

Milwaukee Teachers Cited

Science and mathematics teachers in Milwaukee were recently cited by the Wisconsin SPE for the quality of their teaching and for encouraging pupils. Fred J. Van Zeeland, left, dean of the Milwaukee School of Engineering, presented the awards to, l.-r., Richard A. Crow, Miss Margaret Joseph, and Father John M. Scott.

EJC Survey Reveals Plans of Graduates

A month before June graduation, over eighty-three per cent of the estimated 39,000 engineering graduates had completed plans for post-graduation activities. This was revealed by a survey completed by the Engineering Manpower Commission of Engineers Joint Council.

The specific plans of the graduates included: immediate employment 63.3 per cent; postgraduate studies 10.9 per cent, and military service 8.4 per cent.

Meetings of Note

Society of Automotive Engineers —National West Coast Meeting, August 10-13, Hotel Georgia, Vancouver, British Columbia.

Western Electronic Show and Convention — Annual Convention, August 18-21, Cow Palace Auditorium, San Francisco, California.

American Institute of Electrical Engineers — Petroleum Industry Conference, August 25-27, Wilton Hotel, Long Beach, California.

Western Electric Engineers Urged to V.O.T.E. N.O.

- Group Formed to Combat Unionism
- Movement Spreads to Other States

"Professional status and prestige for engineers through individual responsibility and independent judgment."

That is the theme of a new and somewhat unusual organization of professional engineers who have started a movement with an equally unusual name for the purpose of inducing their fellow engineers to repudiate unionization. The "Veracious Order To Eliminate Nocent Organization," translates into "V.O.T.E. N.O." and further translates into "Truthful Order To Eliminate Harmful Organization."

A group of Western Electric engineers in the North Carolina works of Western Electric started the movement early this year to offset the campaign of the Council of Western Electric Professional Employees-National (ESA) for a pro-union vote in the forthcoming election. The union was certified in 1952 to represent the professional and technical employees, but abandoned its certification by filing a petition with the National Labor Relations Board (NLRB) for a new election after a three-year period without a contract due to a dispute with the company over the professional classification of certain employees. This move by the union provides an opportunity for the Western Electric engineers throughout the country to make a new decision regarding union representation. As soon as the NLRB resolves the differences between the union and the company over the status of certain employees with respect to voting in the professional group, an election date will be set and an all-out campaign will get underway.

In announcing the formation of the "V.O.T.E. N.O." movement, W. L. Crowder, president, an E.I.T. member of the NSPE-affiliated Oklahoma Society of Professional Engineers, stated that the purpose is to give the Western Electric engineers "a truthful picture of the harm that will be done to your career and professional stature if you are represented by a union." Mr. Crowder said his group will not resort to mud-slinging or derogatory statements, but will stress truth and facts.

As the election date draws closer, the V.O.T.E N.O. group has expanded its operations to other areas of the country and is contacting professional leaders among Western Electric engineers to spearhead similar groups in each plant or area in which Western Electric engineers will vote on the union question. Mr. Crowder and C. L. Armstrong, secretary of V.O.T.E. N.O., attended the NSPE 25th Anniversary meeting in New York City in June and contacted NSPE leaders in connection with the planning of their campaign. They conferred with Harry P. Cooper, chairman of the NSPE Engineer-in-Industry Committee; John T. Ludwig, a member of the NSPE group and leader of the successful "no union" drive among Minneapolis-Honeywell engineers two years ago; W. L. Hindermann, NSPE vice president in charge of employment practice activities; L. E. Easley, NSPE vice president taking over Mr. Hindermann's group of committees as the latter retires from NSPE officership, and Milton F. Lunch, NSPE legislative counsel.

The North Carolina representatives said their campaign will consist of distribution of publications written by the engineers or volun-

Officials Meet in New York

Harry P. Cooper, center, chairman of the NSPE Engineers-in-Industry subcommittee talks with members of V.O.T.E. N.O. movement at the NSPE meeting recently in New York. At left is C. L. Armstrong, secretary of the group, and W. L. Crowder, president, is at the right. The movement was formed by the group of engineers in Western Electric's North Carolina plant to combat a pro-union campaign.

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tarily contributed by interested organizations, meetings conducted by the organization in association with professional organizations, and personal visits with each engineer when possible. The emphasis, they said, will be positive, rather than just opposing the union, by stressing professionalism, Canons of Ethics for Engineers, promotion of membership in the technical and professional societies and encouragement of registration. The activity of the group is being financed by voluntary contributions and any funds remaining at the end of their activities will be donated to the United Engineering Center. Additional information on the V.O.T.E. N.O. organization and their campaign can be obtained by writing V.O.T.E. N.O., P. O. Box 1101, Winston-Salem, North Carolina.

Engineering Manager Must Be Well-Informed

The present day manager of engineering who is interested in attaining a leading position for his firm "must use techniques that extend far beyond those found in the discipline of engineering," the Middle Eastern District meeting of the American Institute of Electrical Engineers was informed.

He must be interested in not only technical information, but in such "peripheral" subjects as political science, economics, and psychology, said C. F. Savage of the General Electric Co., New York, N. Y. Mr. Savage is consultant-engineering professional relations, Engineering Personnel Services.

The engineering manager, he said, must develop "a delicate and sensitive sense of balancing" between the technical and nontechnical aspects of his job. By becoming well-rounded and knowledgeable in several fields, he will "produce a professional climate conducive and, in some instances, necessary for more effective work."

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See Page 49

Professional Rulings Announced By NLRB

The NLRB has recently issued the following professional decisions:

• Plant time-study men were ruled to be nonprofessional employees because "it appears that salaried employees, including rate setters and estimators, may progress to these jobs through on-the-job training, supplemented by 'outside study' which, although preferred, is not required." The employer said the jobs required the equivalent of a college degree and two of the six men involved did have degrees. (Reliance Electric & Engineering Co., 8-RC-3386)

• In granting professional status to pharmacists, the Board noted graduation from accredited schools of pharmacy and that all "are licensed to practice in the State of Iowa." (Katz Drug Co., 18-RC-3778)

• A recreation director on a pleasure liner is not a professional employee, according to an NLRB trial examiner. Although she had professional qualifications, the duties of the job were not within the professional definition because they were not "predominantly intellectual." The trial examiner noted, commenting on the direction of sports activities, "a high degree of mental competency and skill is undoubtedly required, but so far as I know no competent authority has seriously described the practice of these professions (baseball, football, tennis, etc.) as intellectual pursuits." (American President Lines, Ltd., 20-CA-1425)

Industrial Engineers Elect F. J. Johnson

The 10,000-member American Institute of Industrial Engineers has announced the election of Frank J. Johnson as its new president. He is manager of production engineering design analysis at the Georgia Division of Lockheed Aircraft Corporation.

New Editions Now Available

Index to National Labor Relations Board Determinations of Professional Employee Status Under the Taft-Hartley Act 1947-1958

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In a completely new arrangement, this publication covers all Board rulings on professional status over the eleven-year period from 1947 to 1958. The tabulation lists, in alphabetical order, all employee classifications whose status was a factor in a Board ruling, the determination of that status as to Professional (P) or Nonprofessional (NP) and the applicable Board decision complete with citation and date. Thirty-four pages.

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Designed to satisfy a long-felt need in evaluating the important and controversial "unionization problem" of the engineering profession, this up-to-date, documented publication lists thirty-one collective bargaining units which predominantly represent engineers, scientists and/or technicians. Also shown is the organization whose employees are represented, the total number of employees represented, the number of dues paying members, the number of professional employees among those represented and the number of nonprofessional employees represented.

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PCA Research and the Cement Story

By

KENNETH E. TROMBLEY

American Engineer Editor

DR. A. ALLAN BATES, vice president for research and development of the Portland Cement Association, is an alert and cheerful man who thoroughly enjoys what he is doing.

"Do you realize," he says with obvious pride, "that there is enough cement in the Hoover Dam to run a four-lane highway from Los Angeles to Kansas City?"

And this pride and intense interest built around a gray powdery substance that has come to be known as portland cement, is felt in every research laboratory PCA maintains in Skokie, Ill., sixteen miles northwest of Chicago, and in the Windy City itself, home of the general executive offices.

"And so mammoth is Hoover that after all these years the heat still released from that mass of concrete would comfortably warm dozens of five-room houses for many years to come."

To know just how much heat concrete holds within itself and for how long, is indicative of the type of problems for which the Skokie research and development laboratories must find answers; answers that engineers across the globe can work with and believe in.

And the success of the Association's professional engineers—from civil to chemical—is immediately apparent.

"The cement industry only produces cement. The uses of our products are entirely in the hands of others. The work of our research and development laboratories have value if it is accepted by these others, the users. These . . . are the engineers, architects, contractors, designers, teachers and students who now and in the future years have the uses of cement in their hands," says Dr. Bates.

Professional engineers who work at the R&D laboratories at Skokie (Cost: $6,000,000; Size: 161,200 sq. ft. of floor space) are dealing with a kind of product that has caught the interest of technical men from all parts of the world for centuries.

In 1824 a bricklayer and mason in Leeds, England, named Joseph Aspdin, secured a patent on a hydraulic cement, which he called "portland" cement because it re-

Engineer (second from right) supervises placement of concrete on hyperbolic paraboloid roof for a church in Milwaukee, Wis.

Dr. A. Allan Bates, left, PCA vice president for research and development, and the late Charles F. Kettering, vice president of General Motors Corporation and research consultant, discuss the merits of a prestressed I-beam.

sembled in color the stone quarried on the Isle of Portland off the British coast. Aspdin's greatest contribution was his method of carefully proportioning limestone and clay, pulverizing them and burning the mixture into clinker, which was then ground into finished cement.

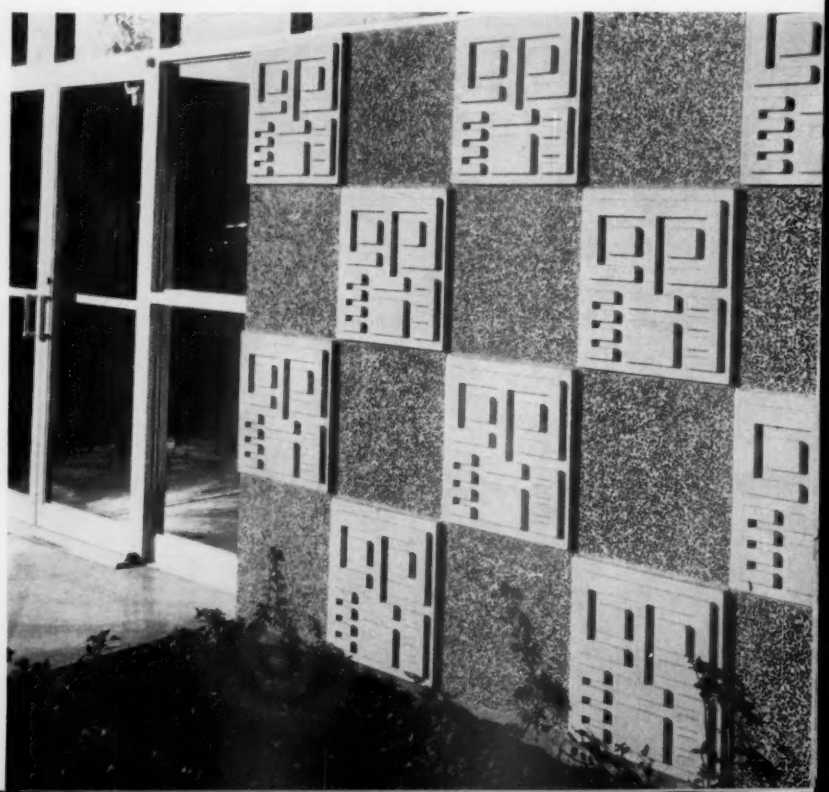
Thus, portland cement itself is an English idea but soon engineers everywhere added contributions. Reinforced concrete came from the French. The original vertical kilns were an ancient German idea borrowed from other industries. The use of slags and pozzolans is of mixed European origin, possibly first Italian in its beginnings and so on to the modern day when prestressing became a workable idea in France and Belgium. America has contributed, among other things, the enunciation of the water-cement ratio, soil-cement, and air-entraining cements and concretes.

"Within the American scene itself, ideas emanate from a great diversity of sources," Dr. Bates points out, "and our laboratories must be even more openly communicative within our national boundaries than we are in the international areas of science and technology. Thus, we have worked diligently to place ourselves in the position of most intimate and unrestrained communication and exchange throughout the world, and have done this in the knowledge and conviction that we are thus establishing traditions and practices which will be to the unending benefit of the industry."

THAT engineers from all branches of the profession have a hand in the past, present and future of cement is not apocryphal. Chemically, portland cement is a combination of lime, silica, alumina, iron oxide and small amounts of other ingredients, including gypsum added in the final grinding process to regulate the setting time of the cement. Physically, it is the result of processing literally mountains of limestone, clay, marl, sand, iron ore, cement rock, slag and other raw materials into a clinker, formed in huge cylindrical steel rotary kilns where a chemical reaction between the raw materials takes place at a heat of approximately 2700 deg. F. To produce finished portland cement, this clinker is then ground into a powder so fine it will pass through a sieve capable of holding water.

Model of proposed section of Seattle Freeway, Washington.

Both chemically and physically, portland cement is one of the most complex, as well as the most widely used, of all modern engineering materials. From the mining engineer who provides raw materials, to the mechanical for processing, to the chemical for testing, the making of cement is a professional team effort. A genuine tribute to all phases of engineering.



Decorative precast concrete panels embellish the entrance to PCA's new Fire Research Center. They were made by using plastic forms that impart an unusually dense and glossy surface to the concrete.

Interstate highway construction in Snoqualmie Pass area of Cascade Mountains in Washington.

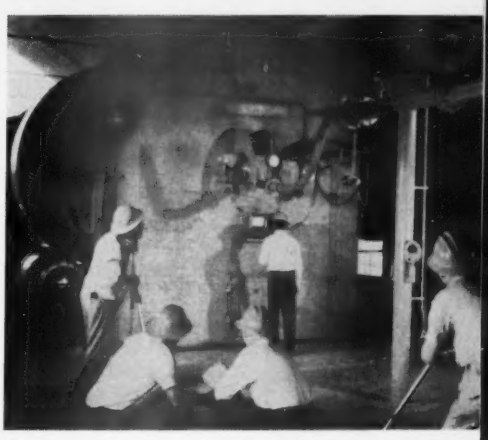
If there is one word one hears more than all others at Skokie, it is "durability." Because concrete structures must serve under widely differing conditions of climate and use, the R&D staff is constantly carrying on observations of concrete in the field under severe conditions of weather and use. To supplement, interpret and expand actual field observation studies, these same conditions are simulated in the laboratories by means of controlled temperature and humidity rooms and testing machines of many types.

In durability tests, for example, engineers subject specimens to moist heat, dry heat and severe cold; to alternate cycles of freezing and thawing, such as occur when rain falls on pavements or other structures that have been exposed to a broiling summer sun. In strength tests, machines rapidly determine the ability of the specimens to withstand the racking, bending, pulling and crushing forces to which concrete is often subjected.

Continuing studies relating to proportioning of materials, placing and curing of concrete, along with durability and strength tests are of vital importance in determining the performance of concrete under different conditions of exposure and loading; but of equal importance are the highly scientific investigations into the complex chemical and physical structure of cement paste and hardened concrete—investigations which are essential in expanding even further

the many uses of portland cement and concrete.

Even here engineers play a part in these precise and continuous studies which are carried out in chemistry and physics laboratories. Chemical analyses are made not only of the portland cements used in making concrete test specimens, but of the raw materials used in the production of the cements, and the aggregates and other materials used with them to make concrete. Meticulous tests, measurements and studies are also made of cement paste, the mixture of portland cement and water which, as it hardens, binds together sand and gravel, crushed stone or other materials, into concrete. These studies are vital, for the quality, performance, and most of the characteristics of concrete are directly dependent upon the materials which enter into its making and upon the



▲ Motion pictures, chiefly in sound and color, are an important part of the Association's educational program.

◀ Staff engineer from PCA's soil-cement bureau takes specimen from soil-cement road for testing.

Observing deflections in a beam under test at PCA laboratories in Skokie, Ill. ▼

The manifold activities of the Portland Cement Association are directed from this all-concrete general headquarters building in downtown Chicago .

Aerial view of PCA's Research and Development Laboratories in Skokie, Ill. In the center are the main and auxiliary laboratory buildings completed in 1950. At left is the Structural Laboratory, and at right the Fire Research Center, both completed in 1958.

characteristic and performance of the cement-water paste.

Over the more than thirty acres of laboratories in this almost rural Illinois community seems to hang an invisible sign with the word "Facts" etched upon it. This is certainly true of the Structural and Fire Research Laboratories which have just been completed. Here concrete will be mistreated as it never has been before including burning of full-scale beams and girders and a gigantic furnace.

Much of the current lab work now going on deals with problems of the time. For example, the great activity in the highway field is reflected in numerous projects. The problem of the highway program in the United States was delineated in the pages of the AMERICAN ENGINEER several years ago by the president of the PCA. G. Donald Kennedy wrote: "In the short span of years since the beginning of the last war, the nation's traffic volume has increased by more than two-thirds, to some 58 million vehicles traveling an estimated 557 billion vehicle miles yearly. By 1965, it is predicted that 81 million vehicles will be traveling 814 billion vehicle miles."

PCA has entered wholeheartedly into the battle to reduce the cost of building highways while making them engineeringly better. Studies at the lab during the past year have concentrated on foundation problems associated with the performance and design of concrete pavements. These problems have been attacked in the laboratory, where static and repetitive loading tests are in progress, and in the field where controlled static and moving load tests have been made. Investigations have also been made in joint performance with emphasis on the transference of loads from one slab to another. In connection with maintenance and reconstruction, an experimental patching project has been completed and tests are in progress to

(Continued on page 40)

On the Cover . . .

Concrete siphon at Dry Coulee, Columbia Basin Project, Washington. Siphon is twenty-five feet in diameter, wall thickness is two feet.

PCA farm field engineers demonstrating technique of properly laying concrete block to a group of vocational agricultural instructors. PCA field representatives are frequently called upon by farmers and agricultural institutions to assist in such instruction.

Inspecting sample cut from a soil-cement road are, l.-r.; B. P. McWorther, former division engineer, Bureau of Public Roads; C. R. McMillan, chief highway commissioner of South Carolina, and G. Donald Kennedy, president of the Portland Cement Association.

FROM WASHINGTON

BY
MILTON F. LUNCH,
N.S.P.E.'s Legislative Counsel

CABOT CARBON, SOUNDING BOARDS AND "FREEDOM OF ASSOCIATION"

"The term 'labor organization' means any organization of any kind, or any agency or employee representation committee or plan, in which employees participate and which exists for the purpose, in whole or in part, of dealing with employers concerning grievances, labor disputes, wages, rates of pay, hours of employment, or conditions of work." [*Section 2 (5)*]

* * * * * *

"It shall be an unfair labor practice for an employer—

* * * * * *

"to dominate or interfere with the formation or administration of any labor organization or contribute financial or other support to it . . ." [*Section 8 (a) (2)*]

◄ Representative Kearns

The above-quoted provisions of the Taft-Hartley Act, read together, constitute the foundation for an understanding of the problem or questions which have long surrounded the "sounding boards" of engineering personnel. A "sounding board," as defined in the NSPE policy encouraging their development and affiliation with the professional engineering society, is:

"a non-bargaining association of engineers, including those in management, employed by one industrial concern, whose purpose is to improve communications between professional engineering employees and management by serving as an objective fact-finding body and whose activities are carried out in accordance with the professional concepts of NSPE."

Within these definitions the question of the status of sounding boards under the law really becomes two questions: (1) Is the organization a "labor organization?" (2) If so, is it dominated by the employer?

The recent Supreme Court decision in *National Labor Relations Board v. Cabot Carbon Company and Cabot Shops, Inc.*, dealt directly with the question of whether a non-bargaining committee is a "labor organization." While the Cabot Carbon committees did not involve professional employees, and although there are very great differences between the Cabot Carbon groups and the engineering sounding boards, the decision has direct implications and significance for the sounding boards.

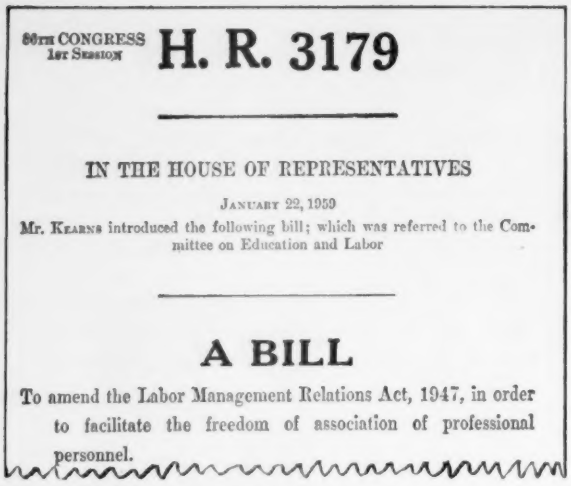
Justice Whittaker ►

Oddly enough, the Cabot Carbon committees were established at the request of the Government (War Production Board) in 1943 in furtherance of the war effort by increased production. Apparently the value of the committees was sufficient for the company to continue them after the war, and without any challenge until November, 1954, when the International Chemical Workers Union, AFL-CIO, filed an unfair labor practice charge on the grounds that the company had unlawfully dominated, interfered with and supported "labor organizations" (the employee committees). The NLRB agreed with the union's charges and entered an order requiring the company to withdraw its support of the committees.

On appeal, however, the Court of Appeals for the Fifth Circuit reversed the NLRB decision and held that the employee committees were not "labor organizations" because they did not negotiate or bargain with the employer. The unanimous Supreme Court decision, written by Justice Charles E. Whittaker, reversed the Court of Appeals, however. In relating the high tribunal's decision to the engineering sounding boards, it is vital to note the many basic differences between the two types of organizations in background and operation, as well as some of Justice Whittaker's language. Looking at these many differences, it would be a gross error to assume that the

engineering sounding boards come within the Cabot Carbon decision. Even the strained pronouncements of the engineering unions, which have long sought some way to destroy the engineering sounding boards, recognize that the decision is not conclusive of the legal status of the engineering organizations.

The most pointed difference in the two types of organizations is that the Cabot committees handled grievances for individual employees, which Justice Whittaker alluded to repeatedly. A second major distinction is that the Cabot



86TH CONGRESS
1ST SESSION

H. R. 3179

IN THE HOUSE OF REPRESENTATIVES

JANUARY 22, 1959

Mr. KEARNS introduced the following bill; which was referred to the Committee on Education and Labor

A BILL

To amend the Labor Management Relations Act, 1947, in order to facilitate the freedom of association of professional personnel.

committees were highly informal and did not have any membership requirements, collected no dues and had no funds. Plant clerks assisted the committees in conducting their elections and did all of their clerical work. The employer paid all of the expenses of the committees. None of this is the case in the engineering sounding boards.

In the Cabot operation there were regular employee committee-management meetings at which "proposals and requests" were made in such matters as seniority, job classification, job bidding, working schedules, holidays, vacations, sick leave, a merit system, wage corrections and improvement of working facilities and conditions. Justice Whittaker notes that the committees met with the company's director of industrial relations and "made proposals and requests with respect to matters covering nearly the whole scope of the employment relationship and which are commonly considered and dealt with in collective bargaining." Also, the company executive sought to reach "some solution" with the committee. "He granted some of them and rejected others, explaining his reasons for doing so."

With this background, it is not too difficult to see how the Supreme Court could conclude that there was "dealing" between the committees and the employer, although the company had argued that the proposals and requests amounted only to recommendations and that the final decision remained with the company. To this Justice Whittaker said: "But this is true of all such 'dealing,' whether with an independent or a company-dominated 'labor organization.' *** Whether those proposals and requests by the Committees, and respondents' (company) consideration of and action upon them, do or do not constitute 'the usual concept of collective bargaining,' we think that those activities establish that the Committees were 'dealing with' respondents, with respect to those subjects, within the meaning of [Section 2 (5)."]

Finally, the Cabot decision proceeded from the open admission that the employer had established the committees, participated in framing the bylaws, provided financial support and company facilities, and otherwise, from a legal standpoint, "dominated" the organizations.

With all of these differences between the Cabot committees and the engineering sounding boards why should the latter even be concerned? The answer lies in the fact that the Court has now determined that the term "dealing with" in the "labor organization" definition is not synonymous with "bargaining with;" that, therefore, certain "discussions" with an employer, on certain subjects, under some circumstances, could be construed as activity bringing the organization within the definition. Then the question of employer "domination" or "interference" would arise. Even though the engineering sounding boards do little or none of the activities indicated for the Cabot committees, the participation of management-level engineers leaves a question, although no case has held that this alone would support an unfair labor practice charge.

The Cabot decision does suggest that both the engineering sounding boards and the employer need to be mindful of the murky area in their relationships. The feeling of limitation and caution which the Cabot decision heightens is, of course, a deterrent to realizing the full value of the sounding board relationship. The full solution to the problem must come through Congressional action. The NSPE-backed "Freedom of Association" bill by Representative Carroll D. Kearns of Pennsylvania, a member of the House Labor Committee, thus takes on new importance. Following the Supreme Court decision, NSPE advised Representative Kearns that consideration of his bill has become more imperative. He was asked to press for action on it as soon as possible and to consider adding its provisions to the pending labor reform bill should that measure be broadened to include other Taft-Hartley amendments not related to labor reform. The Kearns Bill (H.R. 3179) would resolve the problem directly, by adding a proviso after the present "labor organization" definition to specifically exclude organizations of professional personnel which are not certified, nor recognized by the employer, for the purposes of collective bargaining.

Hundreds throng the New York Coliseum to see Russian displays.

U. S. ENGINEERS VIEW SOVIET EXHIBITION

In the next fifteen years the USSR will rise to first place in the world, not only for the over-all volume of production but also for per capita output. —The 21st Congress of the Communist Party of the Soviet Union.

FOR the first time since New York's World Fair in 1939, Americans this summer are getting a chance to view a display of the technological and cultural progress of the Soviet Union.

Here, spread out on three floors of the New York Coliseum are the achievements—or, in some cases, the would-be achievements—which the 21st Congress of the Communist Party boasted last winter would be the forerunner of accomplishments that would bring the people of the USSR the highest living standards in the world.

Accompanied by five members of the New York State Society of Professional Engineers, the AMERICAN ENGINEER toured the $12 million show last month to get a firsthand look at the engineering aspects of the Soviet Exhibition. Taking part in the tour were Herbert F. Roemmele, director of alumni relations and placement officer at Cooper Union; A. G. Kandoian, vice president of International Telephone and Telegraph; E. R. Smoley, consultant in petroleum and chemical engineering; W. J. O'Donnell, chief engineer, Applied Research and Development of Republic Aviation Corporation, and William Wockenfuss, consultant in mechanical engineering.

What the group found was not so much an exhibit of Russia today —although there was ample evidence on this score—but more of what the Soviets hope to have in the future. A future which the Russians see becoming a reality within the next fifteen years.

Everything from fur coats and the latest clothing fashions to television sets and electronic gadgets fill the three floors of the Coliseum. But the big pride of the Soviet exhibitors appears to be their technological and scientific displays which overflow the second floor. Clustered around a huge chrome-plated exhibit of Sputnik models are machine tools, models of drilling rigs, steel mills and super airliners plus dozens of electronic gadgets, navigational devices, and chemical displays. Practically every available inch of the floor is crammed with some item, or some planned product of the Russian technology.

The engineering and scientific exhibits are handled artfully, with a sell-technique not too far removed from Madison Avenue. English language tapes play constantly, describing the more technical aspects of the exhibits. It is obviously a show geared to the general public rather than an attempt to present the technical engineering achievements to American engineers and scientists.

Here's the way one member of

Kandoian

Smoley

Boris Fedjuk, right, an engineer at the Moscow Television Laboratories, discusses Russian electronic achievements with members of the NYSSPE at the Soviet Exhibition in New York City.

Roemmele

O'Donnell

Wockenfuss

the New York group, E. R. Smoley, summed it up:

"The show really isn't designed to present engineering materials to engineers or scientific materials to scientists, but rather to give the general public a sales talk on what they are doing and what they are trying to do . . .

"It's really what they are trying to do . . . actually they are showing the future . . . they are talking about what they hope to do by 1965 and their exhibits and models are models of the future as much as anything else."

Another member, W. J. O'Donnell, spotted the same preoccupation with the future in the housing display:

"They present what they have accomplished to date, but they are trying to show where they are going in housing. The models are all models of the future housing around the Moscow area."

Mr. Smoley saw it as a "contest of the future." "They are selling themselves and their way of doing things for the future."

The exhibit, of course, was by no means limited to the Russian's hopes and dreams. There was plenty of tangible evidence of present-day products and achievements scattered throughout the show — automobiles, tools, television sets, radios, space satellites.

Mr. Wockenfuss got this general impression of the show:

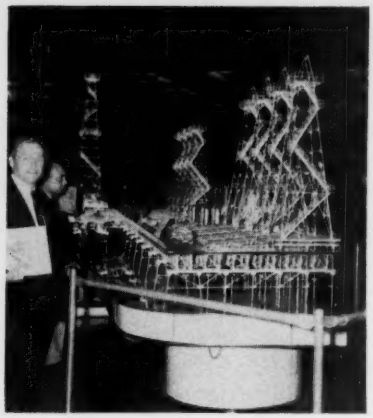
"I think the show was almost spectacular from the point of view that forty years ago they had hardly anything and now have almost everything in process and some of it in actual production. They have made tremendous strides but I believe they still have a few years to go before they equal the quality of our products."

The technicians and engineers who guided the NYSSPE group through the exhibit were perhaps as interesting as the show itself.

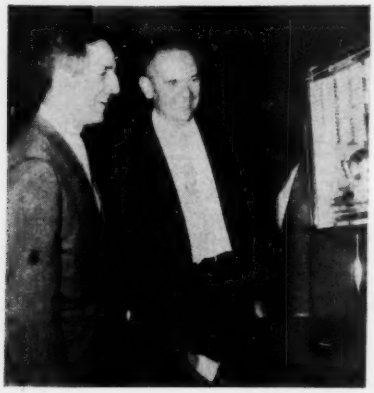
Dean Roemmele was particularly impressed with this aspect.

"I was rather impressed with the fact they did not dodge any questions and tried to go out of their way to tell us important facts . . . On the whole I thought we were well received.

The Russians appeared especially proud of a display of machine tools, several of which operated by punch cards and tape. However, Mr. Wockenfuss, a consultant in mechanical engineering, described the tools as "standard" products. "Nothing exceptional on any one



Models of Russian oil well drilling equipment was one of the featured exhibits in the Science and Technology Division of the Exhibition. Standing at the left is E. R. Smoley, one of the members of the NYSSPE, who toured the exhibit.



Messrs. Kandoian and O'Donnell inspect Russian radio equipment in an electronics display.

of them. Relatively crude by our standards."

While the New York group looked on, one of the machine drills, operated by tape, stubbornly refused to function properly. After a couple of adjustments by the embarassed Soviet technicians, the machine went back to work and obediently etched out the word "Peace" on a metal block.

The Soviets devoted a large part of the display to electronic units. Much of this was in the consumer area—television sets and radios. Among the exhibits was an impressive working model of a Russian airport with the latest in navigational devices. Tiny jet models take off and land while radar instruments plot the course of the plane. Spectators could listen in on the tower instructions by means of telephones located around the model.

After viewing the exhibits, Mr. Kandoian, the ITT engineer, said he believed the Russian's state of art in the electronic field was beginning to be comparable to that of the U. S. He described the radios and television sets on display as "very good," but not too different from the sets in the U. S. and Europe.

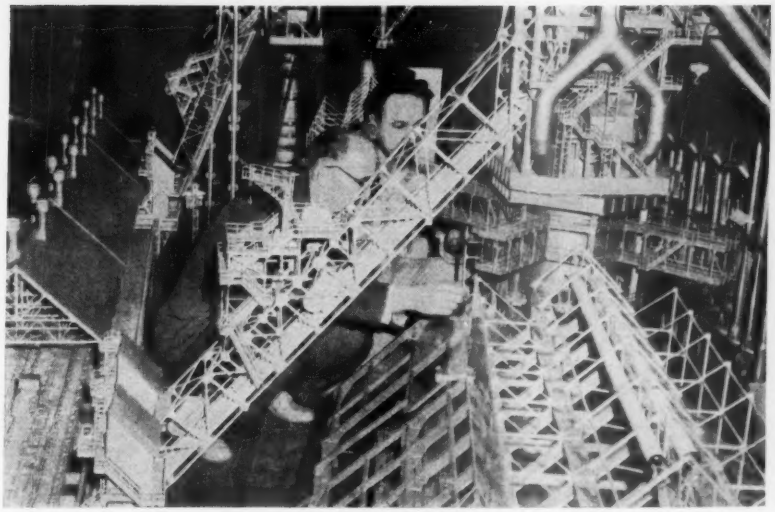
Mr. Kandoian noted that the cheaper sets had printed wiring, while the more expensive models used hand-soldered wiring. He also said the Russians appeared to be farther behind in providing overall nation-wide telecommunications and in the use of micro-wave techniques.

"The ability to get television throughout the country is apparently limited," Mr. Kandoian commented. "Most of it is concentrated around Moscow and the big cities."

"But they are beginning to bridge the gap in electronics . . . whether or not they will continue to forge ahead is anybody's guess," he said.

Boris Fedjuk, who identified himself as an engineer in the Moscow Television Laboratories, led the group through the electronics

The Russians focused much of the attention on space and aviation achievements. Here members of the NYSSPE look over a scale model of one of the Soviet Sputniks. Shown, l.-r., are: A. G. Kandoian, Herbert F. Roemmele, W. J. O'Donnell, and William Wockenfuss.



A working model of a Soviet complex for production of pig iron steel. The exhibit was one of the most elaborate in the technological section of the $12 million show. At the left is A. Osipov, chief of the metallurgical division for the Exhibition, with Robert Willets, head model worker of the Ivel Construction Company of Brooklyn, who helped set up the exhibit.

Russian technicians explain the operations of their machine tools to William Wockenfuss, center, a consultant in mechanical engineering. The tools appeared to be one of the prides of the Russians, but Mr. Wockenfuss described them as essentially "standard" equipment and "relatively crude" by U. S. standards. The tools were part of more than 10,000 items displayed by the Soviets.

display. Speaking flawless English, Mr. Fedjuk was often high in praise of the products he was describing.

Once he flatly stated that the Russian television sets were superior to U. S. models and lamented the fact that the U. S. and other Western nations were not buying them. Later he was asked how the printed circuits in some of the cheaper sets could be repaired. He replied the sets were "twice as reliable" as the U. S. sets because the Russian government maintained strict quality control.

Russian advances in space and aviation were depicted in a series of elaborate models. The displays, however, were not overly revealing from an engineering standpoint.

Mr. O'Donnell, from Republic Aviation, had this to say on these exhibits:

"They actually didn't show very much in these models. Of course, we know they have a good aircraft. In fact they have their TU-114 right out here at Idlewild Airport." (It carried the Russian Minister Frol Kozlov to the exhibit in an eleven hour trip, nonstop from Moscow.)

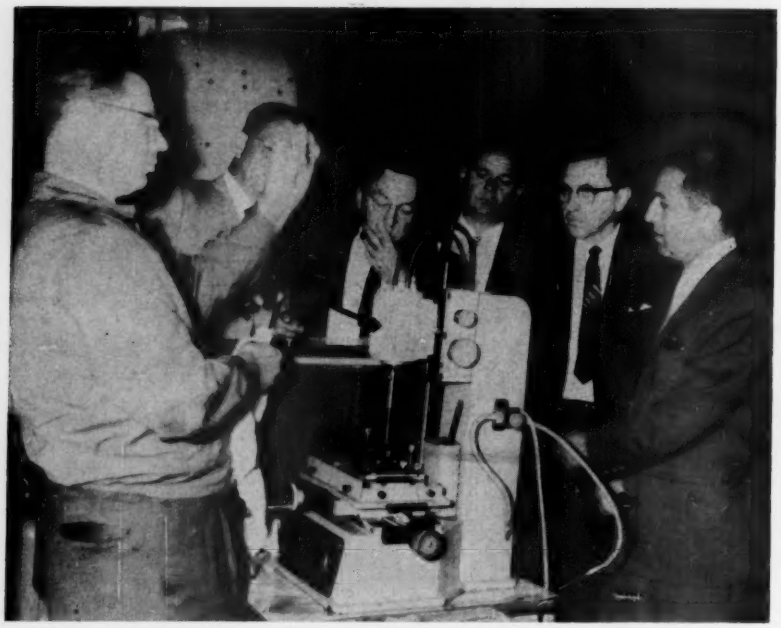
"We also know they have large rocket engines and this has enabled them to do things earlier (in the space field) than we could since they could use cruder electronics in their space vehicles. You might say they did it by the 'brute force' method."

Mr. O'Donnell, however, described the actual exhibits in these two fields as "not much to look at."

Slogans and typical Soviet propaganda statements were tossed in wherever there was an extra foot of space. "In the USSR, Unemployment Has Been Stamped Out For All Time." "People Receive Equal Pay For Equal Work." "In the Soviet Union, Education Is Free of Charge."

Another read, "More Than 90,000 Engineers Are Trained in the USSR a Year."

Mr. Smoley, a consultant in chemical and petroleum engineering, watches closely as a Russian technician demonstrates the working of some of the Soviet machine tools.



Members of the NYSSPE group look on as a Russian technician inspects the finished product from this ultra-sonic device. The device etched out the words "Soviet Exhibition-1959" on small plastic disks.

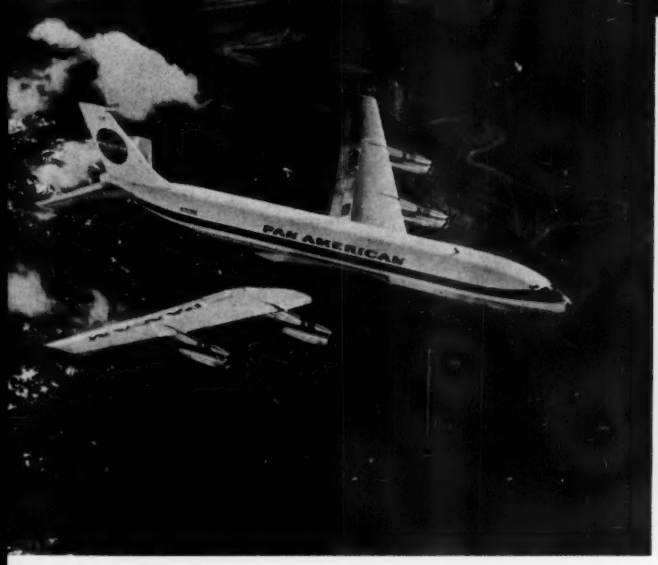
Underneath these high-sounding slogans and statues of heroic workers, were some concrete evidence that it wasn't all propaganda. Evidence of a nation that has moved rapidly in forty years to a place of prominence in the world. And probably more important were the show's numerous hints of Russia's grandiose hopes and plans for its future development.

As Mr. Wockenfuss commented after the tour:

"At the present time I don't worry about their competitiveness, but in twenty-five years I think we better look out."

And Mr. O'Donnell saw it coming even faster.

"I think in less time than that, because they are moving ahead very rapidly . . . I think maybe its a matter of five or ten years."—**End.**



A typical customer for Dulles Airport.

Dulles International . . .

New Concepts in Airport Design

THE Jet Age in transportation came into reality with dramatic suddenness last winter. Today, monstrous jet-powered aircraft are spanning the Atlantic in less than seven hours and speeding their way across the U. S. in something like 4½ hours.

These super aircraft sped into the commercial transportation picture so rapidly that many American cities found their costly airport facilities becoming obsolete overnight. Across the nation, in New York, Washington, Chicago, Los Angeles and dozens of points in between, engineers are at work, updating facilities to meet the demands of the Jet Age.

Many of the old concepts of airport design—some of which haven't been changed basically since the "flying machine" era—are going out the window in this jet-inspired revolution. The end result, aviation leaders hope, will be a series of airports as modern and streamlined as the aircraft they serve.

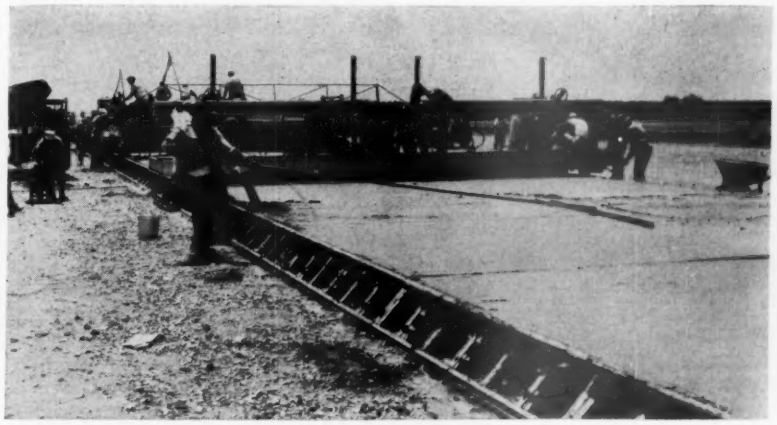
The Federal Government has plunked down $90 million to build one of these Jet Age airports for the nation's capital. The airport, being cut out of the rolling hills of Northern Virginia about twenty miles southwest of Washington, D. C., is an immense forward-looking project that many believe will serve as a model for future jet facilities.

The Washington airport was designed with a new concept—one which would arrest airport sprawl, reduce taxiing and maneuvering of heavy equipment, provide enclosed passage from building to aircraft and, most of all, reduce passenger walking to a reasonable distance.

Problems of airport sprawl and accompanying passenger inconvenience have been multiplying as the bulk and speed of the aircraft increased. The airport began with the grass strip and a shack that sheltered the airport operator and his passengers. That shack became the terminal building. And as bigger airplanes came along, the terminal building grew "fingers"—long enclosed walkways for the passengers. This is the centralized terminal. As the length of the "fingers" grew, they sprouted subterminals to accommodate the weary passenger. This became known as the "decentralized" terminal.

The finger system and its many modifications managed to accommodate airport growth, but at the expense of passenger convenience and airline economy. As more and faster planes demanding longer runways came into being, passengers walked farther and farther.

Designers of the new Washington airport have concentrated much of their efforts to come up with a solution to the sprawl prob-



Workers smooth out concrete on one of the 11,500 foot runways being constructed at the Dulles International Airport near Washington, D. C. The airport will be able to accommodate the latest in jet aircraft when it is completed in early 1961.

A dragline chews out a trench for part of the elaborate drainage system at the Dulles International Airport. The airport will have nearly fourteen miles of drainage pipe and a reservoir which will be able to impound rainwater for about eight hours to avoid flooding downstream areas.

lem which threatened to reach impossible proportions under the demands of the massive jet liners.

The first step toward the solution of the problem, it was decided by the planning group, lay in separating the building from the airplane. So long as one had to go to the other, only minor improvements could be made in the basic problem. What was needed was an effective plan to divorce the aircraft from the terminal and its extensions, and group the planes around isolated special service units.

This would provide for a compact terminal building minus the bewildering mazes of concourses and gates. But, there remained the problem of discovering a means of moving the passengers from this compact terminal to the jets on the service aprons.

During World War II, it was recalled, American bomber crews were ferried by truck from briefing huts to widely dispersed airplanes. Today in such cities as London, Paris, Amsterdam and Frankfurt, conventional buses are used for passenger transportation to airplanes. But, with this system, the passenger must still climb in and out and walk up and down stairs.

HOPING to go this system one better, the designers of the Washington airport came up with the concept of a "mobile departure lounge."

The mobile lounge will stand on cushioned stilts and wheels. Measuring about 15 by 60 feet, it will accommodate about 80 passengers in roomy comfort at second-story level. It will load at either end, like a ferryboat.

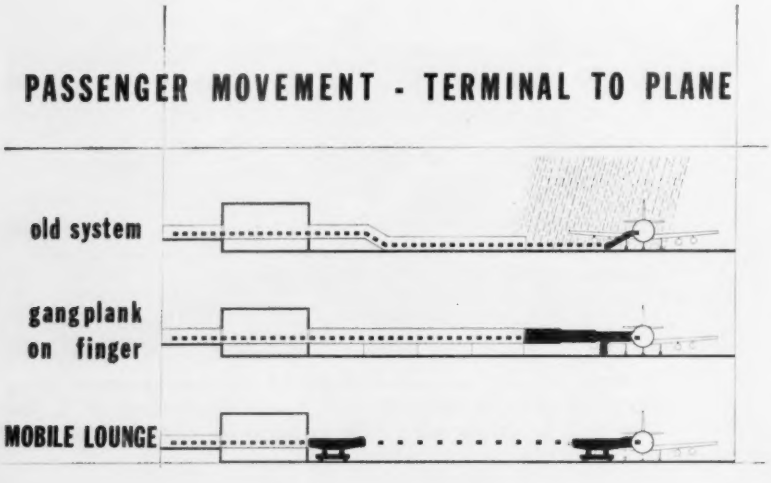
Instead of walking a half-mile from the ticket counter to a loading gate, the airline passenger will walk directly into one of the mobile lounges. The lounges will be docked at loading gates located in a neat row along the wall opposite the main entrance of the terminal. From there the lounges will move swiftly to jet liners located at the various service areas. As the lounge reaches the airplane, pneumatic units at the front of the lounge press against the airplane fuselage and form a sealed unit. The passenger simply walks from his seat on the lounge to a seat in the airplane, eliminating any step climbing.

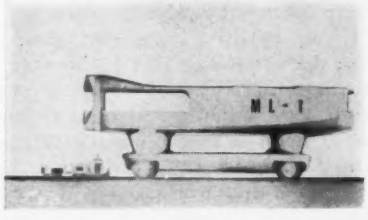
The lounges are costly—estimated at about $100,000 each—but probably less expensive than building a network of sprawling causeways and concourses.

Here's the way the mobile lounge system would compare in average walking distances at the nation's major airports:

Washington	350 feet
Dallas	1,350 feet
Detroit	775 feet
Philadelphia	880 feet
St. Louis	910 feet
Washington National	880 feet
O'Hare (Chicago)	1,030 feet
Los Angeles	1,010 feet

When the new Washington airport opens in 1961, it will have thirty loading positions for the mobile lounges which will serve a like number of aircraft locations on the field. The airport is being





Here's the revolutionary "mobile lounge" concept which will be installed at the new airport. The lounge (above) will ferry passengers from a central terminal building to airliners which will be stationed at service docks at outlying ramps. The system will greatly reduce passenger walking distances and help eliminate noise by moving the jet airliners away from the terminal building.

planned for an eventual capacity of 100 loading gates and 120 aircraft locations.

By 1975, the airport is expected to be handling eight to ten million passengers yearly—more than twice New York's La Guardia and Idlewild combined last year. The Washington National Airport, located just across the Potomac from the District of Columbia, will continue in operation and is expected to handle up to six million passengers. Most of the short haul trips will go into the Washington National Airport while the longer jet flights will be handled by the new airport.

The new airport is located along the Loudoun-Fairfax County lines in a rural area near Chantilly, Virginia. The drive to downtown Washington is expected to be about thirty-five minutes once the access road is completed.

A look at the runway figures give some idea of the immensity of a Jet Age airport. Two runways, parallel to one another and facing true north-south, will be 11,500 feet each. Two other runways facing roughly southeast-northwest will be 10,000 feet long. Each runway will be 150 feet wide with 25-foot shoulders.

The portland cement concrete runways and taxiways are designed for a 100,000 pound single wheel load, based on a 200 psi footprint pressure. This is adequate for an aircraft with a gross weight of 500,000 pounds on a landing gear similar to that used in the current jet transports. In the critical areas, the pavement is fifteen inches thick on nine inches of crushed aggregate base. In the noncritical areas the thickness tapers off to twelve inches. Runway and taxiway shoulders consist of two inches of asphaltic concrete on 4.5 inches of crushed aggregate base.

A MAJOR problem faced by designers was the fact that, despite its primary function as a major international airport for jet airliners, the facilities would have to be able to accommodate medium-size and light aircraft.

The answer was three sets of high speed turnouts for each runway, designed to allow any size airplane, landing at whatever speed, to leave the runway within thirty seconds after touchdown. The light plane with the shortest roll, will swing off onto the turnout nearest the point of touchdown; most medium-sized planes will use the second set. The big jets will roll farthest down the 2-mile runways before turning off.

A tree is bowled over as bulldozers clear the way for the Dulles International Airport. However, as many trees as possible were left standing to provide a natural sound barrier for the jet airport.

Once off the runway, the jet airliner will head immediately for its assigned ramp position, a short distance from the point where it touched down. There it will be serviced and loaded with passengers (by use of the mobile lounge) without the necessity of long taxiing and jockeying for positions at the terminal building.

The airport will be equipped with the latest in lighting engineering and navigational aids. Included will be an Instrument Landing System, Precision Approach Radar, and Aircraft Surface Detection Equipment.

With the many requirements of the jet, the airport will probably be able to claim all sorts of "firsts." Among them is the world's first airport ventilated storm sewer.

The Federal Aviation Agency estimates that as little as forty-four gallons of jet fuel washed into the storm sewer could produce a highly explosive mixture. And the jet fuel—kerosene or a refinement called JP-4—does not evaporate as rapidly as aviation gasoline, heightening the chances for the fuel to reach the storm sewer.

To solve this problem, the FAA recommended the installation of ventilating fans in the 5,000 foot 48-inch sewer line.

The firm of Ammann and Whitney is doing all civil and structural engineering on the airport. Burns and McDonnell is handling mechanical and electrical engineer-

(*Continued on Page 47*)

Huge earthmoving machinery cuts into the Virginia hillsides to make room for Washington's new jet-age international airport. The airport is located about twenty miles from Washington near Chantilly, Virginia.

New Literature

ALUMINUM COPINGS—Complete cross-section drawings, installation details and specifications for Reynolds aluminum copings and gravel stops are supplied in the newest A.I.A. file folder published by Reynolds Metals Company. The drawings are printed on slip sheets for convenient use in direct tracing or reproduction by architects and engineers. In addition to the drawings and specifications, the file folder also contains a complete list of distributors who handle Reynolds copings and gravel stops.

(Circle 15 in Readers' Service Dept.)

TRAFFIC CONTROL—Aluminum's growing role in the field of traffic control today is explained in detail for the benefit of street and highway engineers in a new booklet offered by Aluminum Company of America. Entitled "Aluminum Traffic Control Devices," the publication encompasses all phases of the use of aluminum from street name markers to giant overhead sign structures. It replaces a previous booklet of the same title. Typical types of traffic control devices discussed include flat sheet signs, tubular posts, fasteners, signal posts, message films, and extruded sign systems. Actual installation photographs in all types of atmospheres are pictured. The 24-page brochure also includes details on two newly offered, combination extruded-sheet signs, and Alcoa's new tamper-resistant fasteners. Details on finishing, specifications for all type structures, and reprocessing data are outlined for quick reference.

(Circle 16 in Readers' Service Dept.)

NAMEPLATE DESIGNING—A 20-page booklet which serves as a guide to the engineer designing or specifying nameplates for new products in the development stage has been announced. A complete manual of instructions covering: lettering, composition, step by step procedure for drawing a rough nameplate layout, useful information, selection of materials, nameplate processes, fastening of nameplates, steps in manufacturing, odd shaped nameplates, and check-off list for nameplate buyers.

(Circle 17 in Readers' Service Dept.)

MATERIALS HANDLING—A new 16-page catalog describing and illustrating the L-S complete line of materials handling equipment is avail-

able from Lewis-Shepard Products, Inc. Designated as Condensed Catalog 80-204, the 16-page, 2-color presentation offers specifications and illustrations, on rider fork lift trucks, rider tractors, narrow aisle rider electrics, electric powered "walkies" and manual equipment. An equipment selector chart gives quick visual reference to each type of equipment manufactured in every line of materials handling equipment. Each unit is readily found in the catalog by a selector page index on the front cover.

(Circle 18 in Readers' Service Dept.)

CUSHIONING MATERIAL—A new brochure prepared by EDG-PAK Division of Flex-O-Lators, Inc., gives a progress report on a wide variety of new application uses of EDG-PAK "Strength of Steel Grip in a Velvet Glove" cushioning material. The brochure includes a sample piece of EDG-PAK as well as a cutaway diagram showing its design and protection performance properties. Photographs of the automobile, aircraft and missile industries illustrate some of the many new uses of EDG-PAK in nesting, packaging, and critical edge protection. In addition, ideas on how EDG-PAK can more efficiently serve in every type of packaging or materials handling operation are listed. Complete ordering information is included in the brochure describing each of the eight different kinds of EDG-PAK.

(Circle 19 in Readers' Service Dept.)

HEADERDUCT SYSTEM—With the granting of full Underwriter approval for their headerduct and fittings for cellular steel floors the Conduflor Corporation has issued an 8-page brochure detailing design and application methods for this system. The important features of Conduflor's headerduct system for power, communication, and signal distribution are clearly illustrated. Basic fittings are also shown. According to the manufacturer, trained engineers are available to assist and guide architects and consulting engineers in the layout and planning of projects.

(Circle 20 in Readers' Service Dept.)

INSTRUCTORS' MANUAL—The Automatic Transportation Company published a new Instructors' Manual to be used as a guide for Industrial Truck Operators' Training Program. This 20-page booklet is divided into six stages: theory of operation; good driving practices; details of construction in principal types of trucks; practical operation of the truck; demonstration, and written examination for the driver trainee. Photographs of Automatic industrial trucks are shown to illustrate the details of construction of each particular model manufactured by Automatic. Cartoons are also included to show how accidents happen and how to prevent them.

(Circle 21 in Readers' Service Dept.)

TRUCK ATTACHMENTS—A new 4-page folder, detailing its complete line of industrial truck attachments, designed for safe, efficient handling of rolls of paper, has just been published by The Elwell-Parker Electric Company. The literature illustrates and describes four standard clamp models. Each is pictured together with engineering drawings showing the unit in operation. A complete table of dimensions, plus detailed specifications and operating information is included. One page is devoted to three special attachments: a roll paper apron, the Bartel Grab, and a core ram. Again, detailed information plus pictures are provided.

(Circle 22 in Readers' Service Dept.)

These listings are informational only and are not an endorsement of the products, nor of the manufacturer's claims. To receive any of the new literature described in this column, merely circle the item number in the Readers' Service Dept. and mail to AMERICAN ENGINEER.

Greater Use of a Great Potential

Women in Engineering

Mrs. Leopold

By

ALICE K. LEOPOLD

Assistant to the Secretary of Labor and Director of the Women's Bureau, U.S. Department of Labor.

AMERICAN WOMEN, in small but increasing numbers, have been distinguishing themselves as engineers.

Although women had entered all branches of engineering by the early 1900's and had won both academic and professional honors, it has not been until recent years that their numbers have become significant. The number of employed women engineers jumped from less than 750 in 1940 to approximately 6,500 in 1950, probably as a result of women's tremendous response to the needs of the economy during World War II. Women during that period showed not only their interest in, but their capacity for, employment in this traditionally men's field, and established themselves as a permanent part of the nation's human resources in engineering.

Although approximately one-half of the women engineers in 1950 were employed in civil and electrical engineering, two of the largest engineering occupations, they were represented also in the other branches. Civil engineering employed about 30 per cent of all women engineers, electrical engineering about 20 per cent, and chemical engineering about 10 per cent. Mechanical and industrial engineering attracted the next largest number of women with the remaining number divided about equally between metallurgical and mining engineering, and aeronautical engineering.

The persistent idea that engineering was a hard and rough occupational field and, therefore unsuitable for women has been successfully refuted by the variety of work women have undertaken in this field. While they have been attracted mainly to the design, development and research functions, they have found rewarding employment in many others. Of some 400 women engineers responding to a survey conducted cooperatively by the Society of Women Engineers and the Women's Bureau a few years ago, almost sixty per cent were employed in activities related to designing (33 per cent), development (15 per cent), and research (11 per cent). In addition to the roughly eight per cent employed in each of such functions as technical writing and/or editing, and management, four per cent were teaching or employed in job training; three per cent in production and/or quality control, and the rest in miscellaneous other functions.

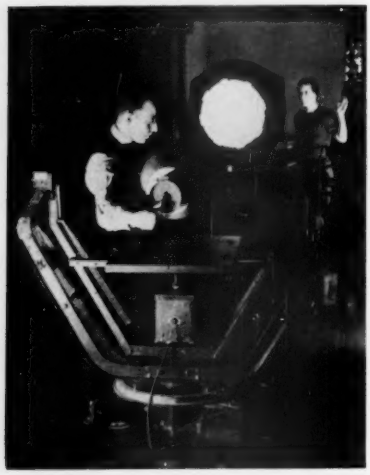
Many of the contributions made by outstanding women engineers are already widely known, but some of their accomplishments deserve emphasis at the risk of repetition at a time when an awareness of the great potential they represent is so essential. The impact made by internationally known Dr. Lillian Gilbreth is common knowledge, but the total impressive story of women engineers must be pieced together from many sources, including newspaper and magazine stories, the biographical sketches of some seventy-five women engineers in the first edition of *Who's Who of American Women* and personal contacts with some of the women themselves.

It is apparent from even a cursory review that women engineers have made their mark on highway construction, on communications equipment, on electronics development, on aeronautical improvements, and on satellite, rocket and missile progress—to list a few areas which amply illustrate the diversity of their interests and efforts. Women engineers, though only 1.2 per cent of the profession, have been chosen as delegates and conferees to international congresses and conferences because of their recognized leadership.

A few brief sketches of individual accomplishments may be

This woman engineer, Miss Emma Barth, is checking the construction of a generator which she designed. She attended evening classes for seven years to earn her engineering degree.

more meaningful in highlighting achievements of women engineers than a long recital of honors, awards, and contributions. There is the story of one able and highly motivated woman who was originally refused admission to the engineering school of her home state, who did not take "no" for an answer, but enrolled elsewhere, completed two years of work in one, and returned—this time to be admitted. Obtaining a position in the Federal Government, her work performance has been such that she has for some time headed the specifications staff in the Aircraft Engineering Division of the Civil Aeronautics Administration.



A former science teacher and co-author of several articles in the field of residence lighting, this woman engineer heads a commercial engineering laboratory.

ANOTHER interesting story is that of a young electrical engineer who embarked on an engineering career with her bachelor's degree at age twenty-one, skillfully combined her profession with marriage and motherhood, and has helped develop improved sonar displays and techniques applicable to anti-submarine warfare.

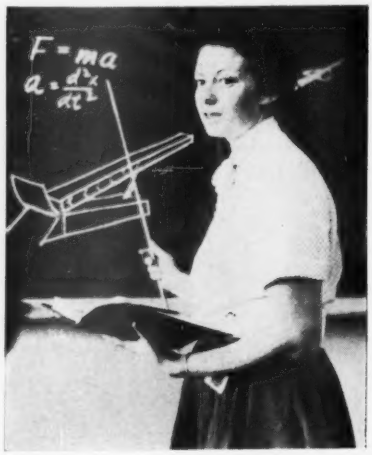
Still another story is that of an engineer who as a girl reportedly took apart all the clocks in the house and put them back together again to run better than they did before. Having demonstrated her capacity in mathematics, economics, and physics as an undergraduate she went on to earn her master's degree and her doctorate, and then achieved the rank of associate professor. She was lecturer in mathematics in several universities, and conducted university research in electromechanics on contract with the Government. She was later sought out by a nationally known firm to develop and direct its programming for electronic computers in which work she has become an expert.

Another example of success in a different field is that of a renowned scientist-engineer who has become a project director in a recognized college of engineering and a world authority on solar energy research. In 1952 she received an award by the Society of Women Engineers as "Outstanding Woman Engineer of the Year." Her successes include such developments as solar stills for life rafts and solar heating equipment for houses.

Equally interesting stories could be told of many more such notable women including that of a chemical engineer, holder of a Master of Science degree from an institute of engineering and employed as an engineer by a large automotive corporation, whose professional growth and activity in many scientific, engineering and honorary organizations have brought her recognition as one of her city's "Women of Achievement;" or a supervisory mathematician in a naval computer division, or still others who helped develop rockets and launching mechanisms for guided missiles.

The influence of women engineers can be found in basic metals, steel, concrete, architecture, shipbuilding, railroads, bridges, automotive equipment, industrial machinery, heating and refrigerating equipment, electronics equipment, household appliances and equipment and many more products essential to our security and our standard of living. The foregoing examples, however, are sufficient to suggest the versatility and diversity of available talent and competence.

Interest in women engineers and in their contribution to economic progress and higher standards of living has become world-wide. During the past year the United Nations Commission on the Status of Women reviewed the participation of women in engineering, architecture, and law throughout the world. Replies to their questionnaire were received from approximately forty countries. Although unqualified comparisons of the data were difficult, a few telling facts were quite clear. We know, of course, of the emphasis placed



This rocket engineer is in charge of twenty-three draftsmen and engineers who are working on a launching system for short-range intercepter missiles.

upon engineering and the sciences in Soviet Russia and on the active participation there of women in large numbers in these professions.

It is, therefore, not surprising that the one fact which stood out above all others was the far higher percentages of women among the engineers in not only the Soviet Union, but also Poland and Czechoslovakia, than in the other European countries or in the United States and Canada. Another impressive fact was that there are women engineers the world over—in Asia; in the Orient; in South America; in small countries, like Thailand and Korea, as well as in large countries, and in basically agricultural countries, like Australia and Argentina, as well as in the highly industrialized countries of the world. An interesting item in point is that two women from Madagascar were studying aeronautical engineering at the time of the report. The third unmistakable fact was that many countries have higher percentages of women among their engineers than the United States.

Mrs. Chung Kwai Lui Wei was the first engineer to make an electroluminescent lamp at a large industrial laboratory—Westinghouse Lamp Research Labs in Bloomfield, N.J.

THE replies indicate that women generally have equality under the law in access to professional training in the reporting countries. Reports from most of the countries stated that equality exists also in actual practice, although two countries reported that preference is given to male candidates when educational facilities are inadequate to accommodate all candidates. Fewer replies, however, indicated that in actual practice women have equal access with men to employment in engineering positions. Some reports indicated that only a few women, or no women had qualified as engineers or demonstrated such ability. Reports from approximately one-fourth of the countries stated that women engineers encountered opposition and prejudice when seeking employment and that men were frequently given preference for traditional reasons. The International Federation of University Women reported in their reply that "in most countries, girls are not attracted or are not encouraged to take up engineering, and the British Association's opinion that 'only those who are really keen will make the effort against discouragement from parents and teachers' could probably apply to a great number of countries."

In the United States, we have been alerted as a nation to the need for many more highly trained skilled scientists and engineers than we have ever before thought necessary. We recognize also the need for more thoroughly and competently trained supporting personnel to utilize more effectively highly trained creative specialists.

Many leaders keenly aware of our needs are calling attention to the potential engineering talent of our womanpower resources. At a conference of employers and educators held at Bryn Mawr College in 1954, the numbers concluded that "Women, judged on the basis of ability and performance, have shown themselves to be capable of holding important positions in research, development, and the application of science."

The President's Committee on Scientists and Engineers stated in October, 1957, that "Obviously, steps must be taken to break down employment barriers to women in science, engineering, and the technician fields. . . . Long established prejudices against women in engineering and science need to be broken down, not only among employers, supervisors, and coworkers, but among the women themselves."

Successful efforts to increase women's participation in engineering must include the motivation of more women to train for the field and the assurance of opportunities to utilize such training.

A review of statistics on engineering enrollments and degrees suggests that women in the United States have hardly begun to take advantage of the training opportunities open to them. We know that most publicly supported institutions admit both men and women to all courses of study. Also, of the 153 institutions accredited by the Engineers' Council for Professional Development in 1958, most are coeducational. Moreover, cooperative engineering programs are open to women as well as to men, and men's schools admit women to graduate courses.

THE total number of women enrolled in engineering degree-granting institutions, however, is relatively small. The United States Department of Health, Education, and Welfare, Office of Education, reports that of the 289,680 total men and women students enrolled for resident or extension course study toward an engineering degree in the fall of 1958, only 1,718 (slightly over half of one per cent) were women. These 1,718 were only one-tenth of one per cent of women's total 1958 college enrollment of 1,148,130.

Total engineering enrollments in 1958 for both men and women suffered a decline for the first time in seven years; for women, the loss was 3.6 per cent and for men, 2.5 per cent. On the other hand, total college enrollments for both men and women reached all-time highs in 1958—for women a gain of 7.8 per cent over the previous year and for men, a gain of 5.3 per cent. Whereas women's total college enrollment in 1958 rose relatively higher than that of men, their total engineering enrollment fell relatively lower.

The number of engineering degrees conferred on both men and women rose at all levels in 1957-58. However, of the 41,767 conferred, only 133 were earned by women. The major branches of engineering in which degrees were conferred upon women included chemical engineering, with a total of 27 degrees; electrical with 25; mechanical with 19, and civil engineering with 14.

Engineering Enrollment of Women, Fall, 1958

Engineering Curriculum	First Degree	Master's Degree	Doctor's Degree
Total	1,583	111	24
Aeronautical	48	6	1
Agricultural	4	0	0
Architectural	48	0	0
Ceramic	25	4	1
Chemical	270	20	1
Civil	138	8	4
Electrical	243	23	4
Engineering mechanics	2	1	0
Engineering physics	28	2	1
General engineering	49	6	0
Geological	6	0	0
Geophysical	2	0	0
Industrial	38	5	1
Mechanical	160	7	3
Metallurgical	16	5	1
Mining	2	0	0
Naval architecture and marine	3	0	0
Petroleum	10	1	0
Sanitary	0	4	2
Textile	6	1	0
Unclassified	427	13	0
Other	58	5	5

The reasons behind these figures are manifold, but assurance of suitable employment opportunities and knowledge of their existence can be strong factors in influencing more women students with the required abilities to study for engineering professions.

Despite the recent slight decline in enrollment the long term trend in numbers of women engineers has been definitely upward, characterized by sharper increases at certain times than others. American women can be counted on to respond to today's demands as they have done in the past in times of national emergency. Increasing participation on their part is inevitable as our labor force expands to produce the goods and services needed for our growing population as well as our national security. The Women's Bureau of the United States Department of Labor urges no special privileges for women but opportunities for them to use their talents and abilities fully to serve our national goals.

—End.

The transmission loss on various types of telephone calls is being demonstrated by Mary Murphy, supervising engineer with the Illinois Bell Telephone Company.

The national president of the Society of Women Engineers, Miss Catherine Eiden, is working on cost studies for a telephone company. She also teaches engineering economics to her fellow workers.

Strictly Business

Personalities . . . **Alexander Matiuk** has been elected vice president and director of engineering for **Burns and Roe, Inc.,** New York, N.Y. . . . **Henry C. Stricker, Jr.,** chief engineer of **Highway Trailer Company,** New York, N.Y., has been promoted to director of engineering. Other engineering appointments also announced by the firm include: **Marvin C. Gietzel,** chief engineer, at the Edgerton, Wis., plant, and **Morris Froomkin,** chief engineer, at Hazleton, Pa. . . . **Carlisle M. Thacker** has joined **Taylor Fibre Company,** Norristown, Pa., as technical director . . . **Leang P. Yeh** has been named consultant to the vice president and director of engineering at **Page Communications Engineers, Inc.,** Washington, D. C. . . . **George F. Kennard,** manager of the engineering laboratory at the Oswego, N. Y., facility of **International Business Machines Corporation,** has announced the appointment of **Edmund A. Barber** as manager of lab administration . . . **Hubert Bennett** has been named director, applications engineering, for **McCormick Selph Associates,** Hollister, Calif., according to an announcement by President **Don A. McCormick.**

Mr. Matiuk

The appointment of **David Y. Keim** as chief engineer-military products of the electronics division of **Stromberg Carlson,** Rochester, N. Y., has been announced by **Kenneth M. Lord,** director of engineering for the division. **Stromberg Carlson** is a division of **General Dynamics Corporation** . . . **United Steel Fabricators, Inc.,** Wooster, Ohio, has announced the election of **W. C. Martin, Jr.,** as president to succeed **Walter A. Locker** . . . **Ralph K. Behr** has been named manager of the New York district sales office of **The Babcock & Wilcox Company's** boiler division . . . **Fred M. Potgieter** has been appointed consultant for the manufacture and sale of universal joints for **Chain Belt Company,** Milwaukee, Wis. . . . The retirement of **Clarence E. Day** as vice president and director of **Harley, Ellington and Day, Inc.,** Detroit, Mich., has been announced . . . **James G. Walker** has been appointed to the staff of **Johns-Manville Corporation,** New York, N. Y., as a special assistant and consultant to the senior vice president for sales . . . New plant engineer at the **Carling Brewing Company's** plant in Natick, Mass., is **Paul E. Uster.**

Mr. Martin

Willard H. Hart has joined the staffs of **Robert J. Strass, Inc.,** and **Hartman-Strass, Inc.,** consulting engineers from Milwaukee and Sheboygan, Wis. . . . The appointment of **Gerald H. Teletzke** to the post of director of sanitary engineer research for **The Eimco Corporation,** Salt Lake City, Utah, has been announced . . . **Porter W. McDonnell, Jr.,** has been named to the newly created position of product manager, Civil Engineering Instruments, of the **Eugene Dietzgen Company,** Chicago, Ill. . . . Four appointments on the engineering staff of **Waste King Corporation,** Los Angeles, Calif., has been announced by **Dr. Hans Jordan,** vice president-engineering. They are **Frank Eidenmiller,** manager, quality control; **Richard Scherer** and **Ralph Forst,** project engineers, and **Clark Stephens,** development engineer . . . **Raymond C. Allen** has been named manager of engineering at **General Electric's** Instrument Department, West Lynn, Mass. . . . **Laurence C. Mathews** will represent the **Portland Cement Association** in the Central Washington area, with headquarters in Yakima, Wash.

Mr. McDonnell

Charles Luckman Associates, planning-architecture-engineering firm of Los Angeles and New York, has announced the appointment of **John C. Narber** as director of planning . . . **Robert R. Allen** has been appointed director of engineering, research and development of **Hewitt-Robins, Inc.,** Stamford, Conn. . . . The appointment of **James A. Burton** to the position of district engineer for the states of Idaho and Montana has been announced by **The Asphalt Institute** . . . **The DAMA Plastics Company, Inc.,** Springfield, Pa., has announced the appointment of **John R. Davis** as president . . . **J. S. Fink** and **Jack Zwecker** have announced the formation of the consulting engineering firm of **Fink and Zwecker Company,** Atlanta, Ga. . . . **Daniel J. Larkin** has joined the engineering department of **Water Service Laboratories, Inc.,** New York, N. Y.

Mr. Burton

Acquisition . . . **Cenco Instruments Corporation,** Chicago, Ill., has announced the acquisition of **Soiltest, Inc. John T. Gossett,** chairman of **Cenco,** has stated that the newly acquired company will be operated as a subsidiary of **Cenco,** with no changes in management.

Pres. Mosher Announces New 1959-60 Society Committees

NSPE President Harold A. Mosher has announced 1959-60 committee appointments as follows:

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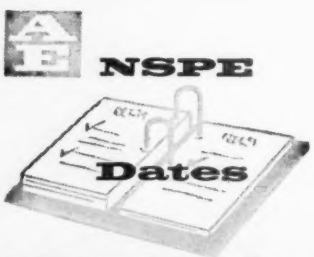

to Remember

Wisconsin Society of Professional Engineers—Summer Meeting, September 18-20, 1959, Dellview Hotel, Lake Delton, Wisconsin.

West Virginia Society of Professional Engineers—Annual Meeting, October 8-10, 1959, Oglebay State Park, Wheeling, West Virginia.

National Society of Professional Engineers—Fall Meeting, October 15-17, 1959, Penn-Sheraton Hotel, Pittsburgh, Pennsylvania.

Professional Engineers of Oregon—Annual Meeting, November 13-14, 1959, Benson Hotel, Portland, Oregon.

National Society of Professional Engineers—Winter Meeting, February 18-20, 1960, Broadview Hotel, Wichita, Kansas.

658 Main St., Dalton, Mass.

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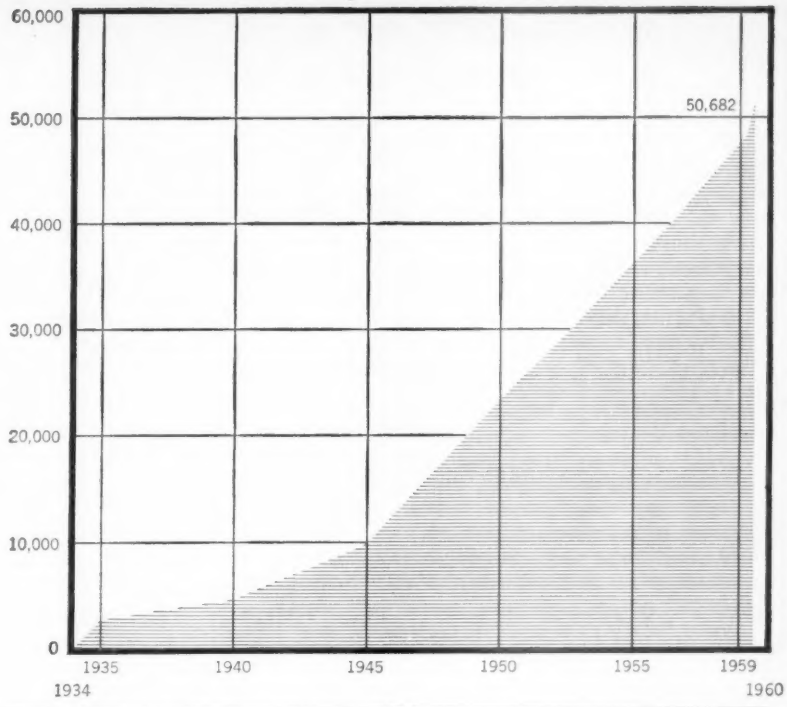

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(Please turn the page)

Thoughts on Professionalism...

By PAUL H. ROBBINS, P.E.
NSPE Executive Director

College Graduates and Professionalism

THIS spring well over 35,000 young men and women completed the baccalaureate education for an engineering career. A survey not long ago by one of our larger and well-known colleges of engineering indicated an interesting trend in the attitude of young people entering an engineering career as to their assurances of professional stature to be gained in engineering.

THE survey indicated a fairly-high confidence in the professional stature of engineering in the sophomore level, less assurance was indicated at the junior level, even less at the senior level, and the decline continued for the first several years of employment. Subsequent to this low point, there was a gradual increase in assurance of professional status for engineering to the point that at about six years out of college nearly the same percentage of engineering-trained people were confident of professional stature for engineering as existed during the sophomore year.

THIS survey was conducted several years ago, and undoubtedly a change has occurred as all members of the engineering profession have come to realize more fully their own responsibilities if they are to be accorded professional status. Certainly there are indications at hand that the graduates of 1959 are more concerned with establishing the professional nature of engineering that has been true in the past. It is interesting to note the number of references in college commencement addresses to the important role which technology will play in the economy, well-being of the people, and world responsibilities of the future. It is equally interesting to note the genuine concern on the part of engineering graduates for their own professional development and stature. One such indication comes in a report from Missouri, which indicates that eighty-three per cent of the graduates of that State took the engineer-in-training examination. Similar reports from other states indicate an increasing awareness on the part of young men entering the profession as to the values of the next step in their professional development, namely, registration.

The professional society has tremendous opportunity to assist these young men and to provide them with a climate in which their contributions can be most effective.

THE Society has taken a major step in this direction with the adoption of the Introductory Membership plan whereby these young men have an opportunity to immediately become a part of the professional society. It is encouraging to note that more and more of the state societies are adopting and implementing this procedure. Its success, however, and the ultimate value in the development of the professional consciousness on the part of these young men are dependent upon the degree to which they are made a part of chapter and state as well at national activities.

It is a challenge, therefore, to local chapters to pay particular attention to creating the kind of professional activity which will challenge the young man, retain and maintain his interest, and develop his consciousness of professional responsibility on which he will build his future career.

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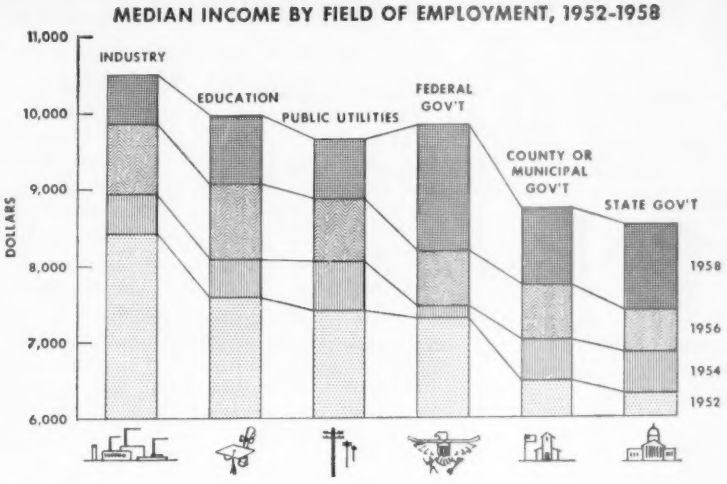
NSPE's 4th Biennial

PROFESSIONAL ENGINEERS' INCOME and SALARY SURVEY



Here is the latest in a continuing series of income and salary surveys of the engineering profession made by the National Society of Professional Engineers. Started in 1952, the surveys are part of a long-range income and salary study program. The fourth biennial survey gives a detailed picture of engineer earnings by year of entry into the profession, by geographical region, by type of employer, by engineering specialty—and by a variety of other categories. Salary and income data from approximately 19,000 registered, professional engineers were studied for this newest survey report. Published in handy booklet form, the 1958 Survey provides a documented study at all levels of professional experience. One of the features of the report is a detailed analysis of salary trends recorded in the four surveys to date.

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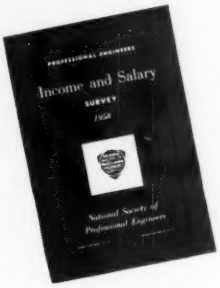

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By Mrs. Garvin H. Dyer, Chairman of the Ladies Auxiliary Advisory Committee.

Reports of activities of the auxiliaries are being received every day and the results tabulated for publishing in the *Engineers Wives,* and many interesting bits of information have turned up, including several new auxiliaries, which had not been previously reported.

The San Fernando Valley Chapter of California has a new auxiliary with Mrs. Millard L. Johnson as its president. Their activities included a Christmas Dinner Dance, an Awards Dinner and a Stardust Ball in June at which installating of officers of both the Chapter and the Auxiliary were held.

The wives of the Hutchinson, Kansas, Chapter have also organized an auxiliary with Mrs. Ralph O. Smith as president. They have had an active and interesting year and are looking forward to a full year of activities starting in the fall.

The South Dakota Auxiliary has completed its final organization at their spring meeting with Mrs. Arthur S. Mannes as the president. This Auxiliary meets four times a year concurrently with the men's meeting, on a state level similar to the men's society.

We have reports that auxiliaries have been organized in New Martinville, West Virginia, Jacksonville, Florida, as well as the Oneida-Mohawk Chapter in New York, but we have no particulars regarding these three new auxiliaries.

PCA

(Continued from page 20)

study the strength characteristics of resurfaced pavements.

STILL relative to highways are the tests to provide further information on the performance of soil-cement for a variety of new purposes. So that engineers may become more familiar with the behavior of this material in sub-bases as well as roads and elsewhere, continuous tests on various soils are conducted to obtain data on their suitability for cement stabilization.

Concrete has long been recognized as a structural material, but in the last few years it has emerged as an important architectural material as well. In the construction of its two new laboratories it was only natural that the Association should practice what it has preached. The exterior walls of the buildings are of precast concrete, the frames and floors of reinforced concrete. The interior walls are of concrete masonry. Sculptured concrete panels were used in portions of the lobby.

Since concrete is plastic when placed, it is possible to cast ornamentation of the same material as the structural portions of a building—and at the same time. A project to determine the effect of concrete block patterns on the structural properties of walls has been pursued vigorously. More than 100 wall panels 4 x 8 feet in dimension have been tested. No previous data on this subject appear in available literature, and such data are needed before building codes can be modified to allow the use of patterns other than those now standard.

The flexural strength of walls has been determined over both horizontal and vertical spans. Over vertical spans the flexural strength was least for walls with continuous horizontal mortar joints, so all patterns produced walls which were at least as strong as those laid in running bond. However, when tested over a horizontal span, walls containing continuous vertical joints were only thirty per cent as strong as the standard running bond.

Extensive test data which will evaluate the performance of walls laid with different block patterns, with various mortars, and with various amounts of horizontal reinforcement will be reported soon.

More tests at Skokie deal with slab-on-ground construction. This

(Continued on page 43)

Misplaced Captions

Somehow, captions were switched in our June issue. These two photos are shown with **correct** captions. **Above:** Roy E. Marquardt, left, president of The Marquardt Corporation, received the outstanding engineer award from Ed Lowell, right, awards chairman, as Billy Schmidt, center, president of the San Fernando Valley Chapter of the California SPE, looks on.

A. Carl Weber, right, director of research engineering for Laclede Steel Company, St. Louis, has received the annual outstanding engineer award from the St. Louis Chapter, Missouri SPE. Mr. Weber is shown receiving the plaque from A. H. Baum, St. Louis building commissioner and first recipient of the award.

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PCA

(*Continued from page 40*)

type of construction was first developed in warm and dry areas where there were few, if any, problems associated with slab. As the economy of this type of construction became more widely known, slabs were used under less favorable conditions and a number of problems developed. One of these is moisture migration through the slab. Water drawn up by heavy soils to the bottom of the slab may pass through the concrete to cause expansion and disruption of wood flooring, or to cause a deteriorating alkali attack on tile adhesive. As a result, a program is in progress to determine the amount of water vapor that passes through concrete slabs under various conditions. The effects of varying the quality of the concrete, and the effectiveness of admixtures and vapor barriers are now under study.

When he returned from a recent trip to Russia, James D. Piper, vice president for promotion for the PCA, reported: "Over-all, I think the Russians may be ahead of us in the practical applications of prestressed concrete, because their governmental system permits them to dictate what construction will be used. However, I do not believe that they are ahead of us in design techniques and certainly they are far behind us in construction techniques. . . ."

And to make sure that the United States stays ahead, PCA is spending hundreds of thousands of dollars each year in the field. The new structural laboratory occupied in 1958 is a unique and highly versatile tool of engineering science. Test facilities for full-scale structural members and assemblages are provided, and the same facilities also permit tests of medium and small-scale models. The laboratory building constitutes, in an integral reinforced concrete unit, a large testing machine housed in an airconditioned crane bay.

New methods of fabricating and testing large-size specimens have been developed, based on extensive use of highly practical, but unusual, devices and equipment. In this manner, PCA is now in a unique position to carry out the large-scale and complex experiments needed to bridge the gap between the engineering arts of practice and fundamental scientific research.

But one cannot leave the research labs without mentioning the large amount of work done on problems in direct relationship to the manufacturing processes of the some seventy member companies of the PCA. How can raw materials be better transported to the plants? How can methods of crushing and grinding be improved? Can costs be cut in burning and cooling? Can finish crushing and grinding be speeded? What about labor, power, and safety? All these and many others come within the manifold program of the Association which must serve member and user alike.

It is a policy of the Association to make all scientific discoveries and new developments, including patentable inventions, relating to cement and concrete uses, fully and freely available to the public in the shortest possible time. The Chicago headquarters or general office is the nerve-center of this mission and it is from this five-story building at 33 W. Grand Avenue that all activities (including those at Skokie and in the field) are administered. This personnel includes, in addition to the management staff, some 130 engineers, scientists, photographers, writers, and other specialists.

To make understandable information available in a hurry is the job of this staff of engineering specialists and writers at Chicago who co-ordinate and translate into easily understandable form specialized and oftentimes highly technical information. This information is then made available to cement users through the Association's field engineers, through short courses, demonstrations and lectures conducted by staff members, and through motion picture films, slides, advertising and a wide range of technical and nontechnical literature.

Through this widespread educational program, the PCA has become generally recognized as headquarters for technical service in its field, and as a clearing house for reliable, up-to-the-minute information on portland cement, the making of concrete, design procedures and construction methods.

Each year the general and district offices of the Portland Cement Association receive approximately 300,000 requests for information.

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These requests come from all over the United States and Canada, by personal calls, telephone, telegraph and mail. Each request is given prompt attention by a competent staff member—whether it be from an engineer, architect or contractor working on a metropolitan skyscraper, or a distant farmer who wants to build a concrete barn floor or feeding lot.

To service the great bulk of these requests quickly and adequately, the Association has prepared some 450 different publications covering the various fields in which cement and concrete are used. The publications range from highly technical booklets on the design of reinforced concrete to simple, easily understood folders on how to build a concrete septic tank or make small improvements around the home. More than 2,500,000 pieces of literature are distributed by PCA in an average year.

To gather, appraise and put into usable form the vast amount of specialized information that is needed to answer requests, the Association maintains six separate technical and promotion bureaus. These bureaus include:

HIGHWAYS AND MUNICIPAL: The Association cooperates closely with engineers, contractors and others in the planning, designing and building of concrete pavements for roads, streets, alleys, airports, parking facilities and other uses. Technical reports and manuals and the *Concrete Highways and Public Improvements* and *Paving Progress* magazines help keep engineers and officials informed on the latest developments in the use of concrete pavement.

STRUCTURAL AND RAILWAYS: The design and construction of large reinforced concrete structures, and the many railroad uses of portland cement and concrete call for a great amount of technical data as well as engineering skill. The Association, through its educational work, its technical service, and three of its magazines —*R/C* (*"Reinforced Concrete"*), *Concrete for Railways, and Architectural Concrete*—furnishes up-to-date information on progress in these fields.

CONSERVATION: Concrete is widely used in the construction of dams, reservoirs, levees, flood walls and spillways, for irrigation and drainage canals, and for water supply, sanitation and sewage facilities. It plays an important role in the restoration, preservation and development of our soil and natural resources, and in the control and supply of water. Through its Conservation Bureau and its district offices, the Association provides technical service and information on the uses of portland cement and concrete in this broad field.

HOUSING AND CEMENT PRODUCTS: Concrete, in addition to being one of the principal wall materials used in the construction of houses, is also used almost exclusively for basement walls, foundation walls and footings, and for a variety of other purposes in home building. In one recent year, for example, concrete was used in the construction of 123,700,000 sq. ft. of house floors alone. The Association furnishes information on the use of concrete in house and small building construction, and on the wide and growing range of concrete products.

FARM: The uses of concrete on the farm are almost as varied as the duties of the farmer himself. Only a partial listing would include its use in the construction of barns, milk houses, feed storage bins, feeding lots and barnyard pavements, silos, tractor and tool sheds, farrowing and poultry houses, water supply and fire-fighting facilities, sewage and sanitation works, soil erosion control, and a multitude of home improvements.

SOIL-CEMENT: The Portland Cement Association won the American Trade Association Executives Award for outstanding public service in developing soil-cement pavements. An educational program coupled with continuing research has expanded the uses of this relatively new construction material. It has resulted in the award or construction of more than 248,000,000 sq. yds. of low-first-cost soil-cement paving in the continental United States for light traffic roads, streets and airports, and for ditch and canal linings, embankment slopes and similar projects.

Spearheading the Association's educational program is a field staff of skilled engineers, architects, farm and construction specialists, working out of thirty-three district offices to serve cement users in forty-seven states, the District of Columbia, and British Columbia.

THESE men are backed by the Association's staff in Chicago which furnishes them with technical information, and keeps them abreast of current progress in all sections of the country. Thus, the fieldmen are able to render expert technical service to engineers, contractors, architects, public officials and other users of cement, and to help them with their cement, concrete, design and construction problems.

At no time does the Association's staff furnish engineering or architectural plans, or in any way assume the functions of the engineer or architect.

The Association makes wide use of visual aids in its educational program. It has some sixty-five motion pictures, most in sound and color, portraying graphically the manufacture of portland cement, and its use in many fields. These films are in constant demand by engineering and technical organizations, and by industrial, agricultural, business, social and educational groups.

One professional engineer at Skokie who had been around for a long time summed up the future of the cement and concrete business as succinctly as could be possible. He said: "Take an orange and imagine it is planet Earth. Let's assume that as we peel the orange we are taking off the outer 20-miles of the Earth's surface. Now we know that in this peeling we hold in our hands all of the world's immediately available materials. We also know that over seventy-five per cent of these materials can be used for making cement." And then after a pause: "I think we will be around for a long time to come."—**End.**

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AIRPORT

(*Continued from page 29*)

ing, including lighting, utilities, water supply and sewage facilities. Eero Saarinen and Associates is in charge of all master location planning and architectural design of buildings.

As part of the total airport project, a high speed access highway is being developed to connect the airport with planned highways for rapid access to downtown Washington. The 17.8 miles access route will connect the airport with the circumferential highway surrounding Washington, D. C., now under construction. The access highway will continue on to a junction with the proposed Interstate Route 66 which will enter Washington over the new Constitution Avenue Bridge.

Washington's new airport is immense by any standards, but planners are leaving plenty of room for future expansion on the 9,700 acre site.

At the present nearly 12,000 passengers are flying in and out of the nation's capital each day. Within twenty years, the FAA expects that figure to jump to more than 40,000 daily.

Designers of the new airport figure that, in 1965, about thirty-two planes will be either landing or taking off during each of the sixteen busiest hours of the day. By 1975, this figure will have reached fifty-one operations in the peak hours.

Much of the increase is expected to come from international travel. During 1958, there were less than 5,000 passengers on international flights at Washington National Airport. However, market research studies indicate that the potential for international traffic in the Washington area is 156,000 annual passengers by 1965 and 464,000 by 1975.

Construction on the new airport began almost a year ago, but the project was without an official name until last month when President Eisenhower decreed that it would be known as the Dulles International Airport.

Until the presidential designation, the airport had been unofficially dubbed Chantilly after the nearby community.

Virginians, particularly those living in the immediate area, had sought to have Chantilly for the permanent name. Others had requested that the project simply be called the Washington International Airport.

The first of more than 1,650,000 square yards of pavement for the runways was started in mid-summer, but actual opening of the airport is not expected before early 1961—End.

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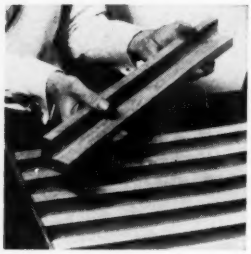

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CONDUCTIVITY METER — Item 31

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HOURMASTER — Item 32

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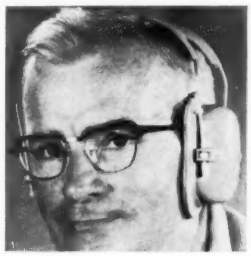
CONVERSION CHART — Item 33

A reference table for engineers in wall chart form has been published by Precision Equipment Company. This conversion chart is useful for engineers, shop men, and other executives. Included are common conversions such as inches to centimeters or watts to H.P. as well as many conversions that are difficult to locate in reference manuals. Some such examples are atmospheres to Kgs/sq. cm. cm/sec to miles/hr, cu. ft. to liters, microns to meters, quintal to lbs., etc.

QUIET-EAR — Item 34



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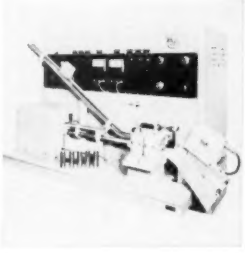
A new portable combination compression-tension testing machine makes it possible to test concrete cylinders or reinforcing bars for strength in a field or laboratory installation. The compression capacity in testing 6" diameter standard concrete cylinders in 200,000 pounds. The hand operated tester is entirely self contained. No pressure or electrical connections are required. The machine is also designed for testing specimens in tension up to the 100,000 pound load capacity.

HARDNESS TESTER — Item 36



This new instrument, which can be fed manually or receive parts directly from a processing machine, automatically measures the hardness of piston pins at rates of up to 2400 per hour, and sorts them into acceptable and reject categories. The pins are cross-fed under two standard hardness penetrators whose load can be changed for various scale ranges. The indication on the panel corresponds to the scale used.

TEAR DROP CURVES — Item 37

Tear drop curves that greatly simplify highway interchange design have been introduced by Keuffel & Esser Company. Especially effective in short-radius work such as limited-speed controls, exits, entrances, and acceleration/deceleration lanes, the new curves can be used in any layout work involving circles and arcs. According to K&E engineers the new templates simplify all short radius work that previously required the time consuming and tedious process of drawing with a combination of various curves to obtain one curve design.

This column describes new products of general interest to professional engineers. For further information, circle the item number in the Readers' Service Dept. and mail to AMERICAN ENGINEER.

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